STUDY OF AIRPOWER

HEARINGS

BEFORE THE

SUBCOMMITTEE ON THE AIR FORCE

OF THE

COMMITTEE ON ARMED SERVICES

UNITED STATES SENATE

EIGHTY-FOURTH CONGRESS

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STUDY OF AIRPOWER

TUESDAY, MAY 22, 1956

UNITED STATES SENATE,
SUBCOMMITTEE ON THE AIR FORCE
OF THE COMMITTEE ON ARMED SERVICES,
Washington, D. C.

The subcommittee (consisting of Senators Symington, Jackson, Ervin, Saltonstall, and Duff) met, pursuant to adjournment, at 10:10 a. m., in room 212, Senate Office Building, Senator Stuart Symington (chairman of the subcommittee) presiding.

Present: Senators Symington, Jackson, Saltonstall, and Duff.

Also present: Fowler Hamilton, general counsel; Ramsay D. Potts, Jr., associate general counsel; Fred B. Rhodes, legal consultant to Senator Saltonstall; Edward C. Welsh, assistant to Senator Symington; and Ronald Friedenberg and Wallace L. Engle, staff members.

Maj. Gen. Samuel R. Brentnall, Assistant Chief of Staff for Guided Missiles, USAF; Brig. Gen. Charles M. McCorkle, Deputy Assistant Chief of Staff for Guided Missiles, USAF; Lt. Gen. James M. Gavin, Maj. Gen. J. B. Medaris, Brig. Gen. John P. Daley, USA; Brig. Gen. Thomas C. Musgrave, Jr., USAF; Lt. Col. Donald S. Bussey, OSCS Operations; Brig. Gen. John P. Daley, Director of Special Weapons, Office, Chief of Research and Development, Department of the Army; Brig. Gen. David W. Gray, Director of Operations, ODCSOPS, Department of Army; Brig. Gen. R. D. Meyer, Chief, Requirements Division, Office Deputy Chief of Staff, Logistics, United States Army; Maj. Gen. Russell L. Vittrup, Assistant Deputy Chief of Staff for Military Operations, Department of Army; Lt. Col. Woodrow B. Sigley, Office, Chief, Research and Development, Department of the Army; Col. John C. Dalrymple, Office, Chief, Research and Development, Department of the Army; Lt. Col. John R. M. Covert, Office, Chief of Research and Development, Department of Army; Lt. Col. Claude C. Young, Office, Deputy Chief of Staff for Military Operations, Department of Army; Lt. Col. W. J. Lynch, Plans Division, Office, Deputy Chief of Staff for Logistics, Department of Army; Lt. Col. Francis J. Kelly; Lt. Col. Vallard C. Smith, Missile and Air Defense Division, O. C. R. & D., Department of Army; Lt. Col. Allan S. Hirsch, ODCSOPS, Department of Army; Lt. Col. William Teir, Missiles and Air Defense Division, Office, Chief of Research and Development, Department of Army; Lt. Col. Elmer P. Curtis, Office, Chief of Research and Development, Department of Army; Henry F. Magill, 1st lieutenant, Ordnance Corps, aide de camp to Maj. Gen. J. B. Medaris; Maj. Ralph C. Wardlow, Department of Army; Jack Stempler, Assistant General Counsel, Department of Defense; Capt. S. S. Searcy, Jr., United States Navy, Office of C. N. O.

* * * * * * * *

[The closed session testimony was censored by the Department of Defense for security reasons. Those portions of the record affected by this censorship are indicated by the symbol ⓓ.]

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Senator SYMINGTON. This meeting of the Subcommittee on the Air Force of the Senate Armed Services Committee will now come to order.

General Gavin, we welcome you here this morning.

Your record is only too well known to all citizens. We would like to get that record to place it here.

LT. GEN. JAMES MAURICE GAVIN, UNITED STATES ARMY

James M. Gavin, who is a native of Mount Carmel, Pa., was born on March 22, 1907. He enlisted in the Regular Army in April 1924 and served until June 1925, advancing to the rank of corporal. In July 1925 he entered the United States Military Academy at West Point, N. Y. He was graduated from the Academy and commissioned a second lieutenant of infantry on June 13, 1929.

As a lieutenant his service took him through tours of duty with the 25th Infantry in Arizona, the Infantry School at Fort Benning, Ga., the 38th and 29th Infantries at Fort Sill, Okla., the 57th Infantry (Philippine Scouts) and finally the 7th Infantry at Vancouver Barracks, Wash.

In 1939 he was promoted to the grade of captain and in August 1940 became an instructor in the Department of Tactics at the United States Military Academy.

A year later he attended the Parachute School and upon graduation was assigned to the 503d Parachute Battalion. In December 1941 he became plans and training officer of the provisional parachute group at Fort Benning, Ga., and the following April was designated G–3 of the Airborne Command at Fort Bragg, N. C.

In September 1942 he was promoted to the grade of colonel and went to Europe in command of the 505th Parachute Infantry Regiment. Under his command the 505th Parachute Combat Team spearheaded the assault of Sicily on the night of July 9, 1943, and he commanded the regiment in the parachute landing on Salerno Bay the night of September 14, 1943.

He was promoted to brigadier general in September 1943 and in October 1943 was appointed assistant division commander of the 82d Airborne Division while on duty in Naples, Italy. The following month he went to London, England, as airborne adviser to the Supreme Commander. He remained on duty with the Supreme Allied Command until February 1944 when he returned to the 82d Airborne Division as assistant commander at Leicester, England.

As assistant commander of the 82d Airborne Division, he participated in the parachute invasion of Normandy on June 6, 1944. He assumed command of the division in August 1944, and shortly thereafter commanded the airborne operation in the vicinity of Nijmegen, Holland. He was promoted to major general in October 1944. General Gavin retained command of the 82d Airborne Division throughout the remainder of the war, participating in the Battle of the Bulge in the spring offensive in 1945.

In July 1945 he moved with the division to Berlin, Germany, where he served as American representative on the city kommandantura, in addition to his duties as commander of the 82d Airborne Division. In December 1945 he returned to the United States where he commanded the 82d at Fort Bragg, N. C., until March 1948.

He was then appointed Chief of Staff of the Fifth Army at Chicago, Ill., until April 1949 when he returned to Washington, D. C., as Army member of the Weapons Systems Evaluation Group in the Office of the Secretary of Defense.

In June 1951 General Gavin again went overseas where he served initially as chief of staff of the Allied Forces in Southern Europe. In December of 1952 he assumed command of the United States VII Corps in Germany. He was reassigned from that command to Washington, D. C., in March of 1953 at which time he became the G–3 of the Department of the Army.

In March of 1955 he was designated as Deputy Chief of Staff for Plans and Research of the Department of the Army and promoted to the grade of lieutenant general.

On October 10, 1955, General Gavin was appointed Chief of Research and Development with status as a Deputy Chief of Staff.

In addition, General Gavin is the author of a book, Airborne Warfare, published in 1947 by the Combat Forces Press, and several magazine articles which include: The Future of Armor, the Infantry Journal and Armor, 1947; Tactical Use of Atomic Weapons, Infantry Journal, 1951; Cavalry—And I Don't Mean Horses, Harper's 1954. He has also written a number of articles on airborne warfare which were published in the Infantry Journal, 1946–47.

DECORATIONS

Distinguished Service Cross with one oak leaf cluster.
Distinguished Service Medal.
Silver Star with one oak leaf cluster.
Bronze Star Medal with one oak leaf cluster.
Commendation Ribbon with metal pendant.
Purple Heart.
American Defense Service Medal.
American Campaign Medal.
European-African-Middle Eastern Campaign Medal with arrowhead and 1 silver service star (in lieu of 5 bronze service stars) and 1 bronze service star for participation in the Sicily, Naples-Foggia, Normandy, Rhineland, Ardennes-Alsace and Central Europe campaigns.
World War II Victory Medal.
Army of Occupation Medal with Germany clasp.
National Defense Service Medal.
Combat Infantryman Badge.
Parachutist Badge with four combat jump stars.
Distinguished Unit Emblem.
Belgian: Order of the Crown with palm, grade of commander; Croix de Guerre with palm (1940).
France: Legion of Honor, rank of officer; Croix de Guerre with palm.
Great Britain: Distinguished Service Order.
Italy: Order of the Crown, grand officer.
Netherlands: Order of Orange-Nassau, with swords, grand officer.
Morocco: Order of Ouissam Alaouite Cherifien, grade of grand officier.
U. S. S. R.: Russian Order of Alexander Novsky.
Belgian Fourragere.
French Fouragere.
Netherlands Orange Lanyard.

Senator SYMINGTON. It is an honor to have you with us today. We did not get through our hearings the other day, and therefore we asked General Brentnall, who stayed through 2 days, to be with us at 11 o'clock to show a group of pictures of missiles of the Air Force.

We plan to have the pictures from General Brentnall and would welcome your being here and looking at them and look forward to seeing you again this afternoon.

General Brentnall, what classification do your pictures cover?

General BRENTNALL. Secret, sir. Not top secret.

Senator SYMINGTON. Not top secret?

General BRENTNALL. No, sir.

Senator SYMINGTON. General Gavin, we would be very glad to have anybody else you brought over this morning stay to see the pictures of General Brentnall, anyone with clearance through secret.

General, it has been the custom of this committee to swear all witnesses. If there is anybody else you have brought this morning who is going to testify, he should be sworn at the same time?

General GAVIN. I have a number that I would like to have sworn because during the course of the hearing I will call upon them from time to time.

Will those gentlemen who I designated this morning as being eligible as witnesses come on up here if you will, please.

Senator SYMINGTON. Will you raise your right hands, please.

Do you solemnly swear that the information you give this morning to this Subcommittee on the Air Force of the Senate Armed Services Committee is the truth, the whole truth, and nothing but the truth, so help you God?

General GAVIN. I do.

(The following were sworn: Lt. Gen. James M. Gavin; Maj. Gen. J. B. Medaris; Brig. Gen. John P. Daley; Brig. Gen. David W. Gray; Brig. Gen. Richard D. Meyer; Col. John C. Dalrymple; Col. Arthur Small; Lt. Col. John R. M. Covert; Lt. Col. Woodrow B. Sigley, and Maj. Ralph C. Wardlow.)

Senator SYMINGTON. Gentlemen, will you identify yourselves to the reporter.

General Medaris, it is good to see you. It has been a long time. General Gavin, have you a prepared statement?

General GAVIN. Yes, sir; I have.

Senator SYMINGTON. Would you like to read it?

General GAVIN. I shall, and in the course of the reading of it I would like to depart from it physically and refer to the charts.

However, the substance remains the same.

Senator SYMINGTON. Please handle that at your pleasure.

TESTIMONY OF LT. GEN. JAMES M. GAVIN, CHIEF OF RESEARCH AND DEVELOPMENT, DEPARTMENT OF THE ARMY

General GAVIN. Mr. Chairman and gentlemen, I am very pleased to have the privilege of appearing before this committee to discuss the Department of Army's missile and later aircraft program. As background for the presentation which will follow, I would like to take a few minutes to present the Department of the Army's views of the most significant aspects of the current military situation as they will affect the Army's capabilities in the future.

My briefing will be background for the briefings that will follow, which will be in some detail, more technical.

Senator SYMINGTON. General Brentnall, will you come up here and sit at the end of the table so you can hear General Gavin better?

General Medaris, if you would like to sit here we will be glad to have you.

Excuse me, General.

General GAVIN. That is quite all right, sir.

The Department of Army's progams in missiles and aircraft are intended to give it a capability of fighting successfully in any war or police action short of war in which our Nation may find itself.

READINESS FOR SMALL OR GENERAL WARS

The Department of the Army's mission is by its evident readiness at all times, to be ready to win in a general war.

At the same time it must, by virtue of its high state of readiness both in terms of modernization and mobility, deter small wars or deter any aggressor who would attempt to achieve a limited objective through limited military action.

If a small war does occur, we must win such a war or failure to win would in itself bring on a general war.

The Department of the Army has been studying extensively the implications of atomic warfare for the past several years. About 2 years ago the Army initiated a divisional test that culminated in Exercise Sagebrush of last fall.

DEVELOPMENTS IN ARMY ORGANIZATION AND TACTICS

Based upon the lessons it has learned during this time it has now decided to go ahead with a pentagonal-type organization that would be equipped to fight in a tactical atomic environment. It will also have a nonatomic capability. It is known as the Pentagon-type division based upon battle groups organized in combined arms, five in each type division.

In addition to this new divisional organization the Army has activated a hypermobile division, the 101st division, equipped with nothing heavier than a mechanical mule which is about like a jeep, and finally it has activated on a provisional basis a reconnaissance unit that moves by air, by helicopter, sky car. For the purposes of illustration I would like to present to you several charts that schematically portray the trend in Army organization and tactics, and I would like to refer to these charts now and again. The purpose of the charts is to portray in a schematic way the considerations that bore upon the reorganization problems that we have had and ultimately led to the reorganization that we now are emerging from.

This chart portrays the organization of the defense of an area for which our United States Seventh Army is now responsible, the southern area of Germany, Bavaria.

The organization hereon reflects the type defense that would have been adopted following World War II prior to the tactical employment of atomic weapons being a prospect.

I should say further that this study reflects the considerations of a commander and group of staff officers on the ground responsible for this defense, and while we talk of defense rather than offense, it is because defense is the first concern of this army in this area.

Immediately following this deployment, which shows divisional deployments between the double X's a density study of the entire area was made to determine its vulnerability to tactical atomic attack.

We are in the Army convinced that the U. S. S. R. is training to use tactical atomic weapons and pursuing a development and firing program without apparent object in sight.

TROOP DENSITY AND DISPERSAL

The density of this area was determined by placing a grid system of 5-kilometer grids, 5 kilometers on a side, two and a half kilometers being immediately equidistant for a 50 KT weapon and following that a determination was made on every soldier, every round of ammunition, every gallon of fuel oil, and every pound of supplies in the area.

The next chart shows a graphic portrayal of the troop density.

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The legend on the left illustrates the very high density in some areas, 4,000 and over per 5-kilometer square which would be exceedingly vulnerable of course and so on down.

The 5 kilometers is generally like that dark area. There are a number of aspects of this type deployment which I would like to bring to your attention.

First of all, the only people holding ground is this thin crust in front, the artillery and engineers in back of them do not directly hold ground although they contribute to its retention.

VULNERABILITY TO ATOMIC ATTACK

Furthermore the structure is based upon a monolithic system of communications and supply where things come from a large source, fanning out finally to the ultimate user, which means that this system is very vulnerable to severance at any one point where a type of atomic weapons are employed.

It is apparent, and this was done on the ground too, that a Russian force using tactical atomic weapons would shatter this defense very quickly indeed and would penetrate very deeply. (D)

For a theater they may want much longer ranges. Communications must be much better to retain a degree of control over this dispersion. As an illustration of how an attack might be expected to go into such an area, this portrays in general what one would anticipate.

ATTACK PROCEDURE

I should say further that while these people are all in armored vehicles on tracks or wheels, all reconnaissance elements must be airborne, these they must be in helicopters or vertical takeoff aircraft.

In Germany we are right up against the border where we could deploy in the optimum degree, we would have 100 miles forward of such a defense forces in helicopters and light aircraft keeping land forces of the enemy under surveillance and giving us targets initially before the main blow fell on the organized defense.

Very quickly I would like to point out the problem that has concerned us in offense. (D)

We are satisfied now that this—and this was our own type of attack up through World War II—would be exceedingly vulnerable in the face of tactical atomic defensive weapons.

We have tried one other scheme of attack in this very area, and it has worked quite well, and then we put it to a test in the Nevada tests when we had our infantry and armored personnel carriers stay off a considerable distance and then move in with a coordinated attack with the firing of an atomic weapon.

As a schematic illustration of this, this chart portrays battle groups, and that is what these are, some six of them in the pentagonal type organization.

When tactical atomic weapons were fired in the objective area the initial reconnaissance would be made by some type of aircraft.

We are not fixed in our thinking on this, the art is dynamic, it is moving very fast and we may be beyond helicopters soon into new types of vertical takeoffs.

Initial reconnaissance in the area, all forces amphibious on inland waterways, through the blast area and out, exploiting what they have been able to achieve in the initial attack.

We are convinced that in a tactical atomic war——

Senator SYMINGTON. Could I ask a question for clarification?

Before you showed a defense and a defense in depth.

General GAVIN. Yes, sir.

Senator SYMINGTON. That had to do with an attack.

Which side of the river are our forces on today?

General GAVIN. Our forces today are on this side of the river [indicating].

Senator SYMINGTON. Will you proceed, General?

General GAVIN. Yes, sir.

Very briefly now I would like to run through the three essential functions of a fighting man on land, his firepower, his mobility, and his communications, and he must communicate to use these effectively and the better they are the better his communications must be.

And I will run through them briefly as background.

They will be discussed in detail by the officers who follow me.

FIREPOWER

This chart portrays the firepower in large chunks, let us say, the larger weapons that we now have.

In the division we have the 105 and 155 of World War II fame firing a very light charge of high explosive.

We now have the 280, we have the Honest John and Corporal with atomic warheads, and we have the Nike 1 firing a high explosive warhead.

The next chart illustrates the firepower that we foresee in both the division and the corps. (D)

These are the weapons now in development, some with both an atomic and a nonatomic capability.

Starting with the 106 recoilless, it is now a very fine antitank weapon, fires a high explosive round. (D)

We want to give the division, and now I speak of the elements in a division such as a battalion tactical atomic support, precise delivery systems that can attack tactical targets and give intermediate support.

ATTEMPT TO GEAR MISSILES INTO CHANGING TACTICS

To achieve greater range and greater independence of operation in the Army area, we are endeavoring to improve the Honest John, and are developing the Redstone and other missiles with differing capabilities. (D)

As I say, these will all be discussed by the briefings that follow me. The significant thing about this is that the missile family very clearly fits into the need for great dispersion and at the same time fires support regardless of day or night. (D)

MOBILITY

A great deal has been said about mobility. We are endeavoring to use to an optimum degree air mobility. We look to something that flies very slow such as a vertical takeoff and we can use very close to

the ground. We want to get our wounded out much better than we did in Korea.

We want to maintain control over a vast dispersed area. The whole state of the art is very dynamic and that is an understatement. All these type aircraft are either in test or in development now. These of course are being used today and this was used in Korea.

There are additional types here such as have been experimented with, are currently in study and we hope in the future to develop trends that we find in them.

The air mobility vehicle is used only for reconnaissance units. We are aware of the fact that in almost every atomic round fired near the surface so far the initial reconnaissance has been by air vehicle.

We have provided the signal communications equipment and frequently personnel who made that reconnaissance.

We consider this very much part of the land role in future combat. Here are new types of track vehicles. (D)

I say we hope. We have this development well underway now. Within a year we should have a prototype.

COMMUNICATIONS

This summarizes briefly the communications problem with which we are all familiar, the vehicle, messenger, the land-pole wire, man-laid wire, vehicular radio, large switchboards, and so on.

We have done a number of things in the communications field. First of all the possibilities of bouncing communications off the troposphere and ionosphere is now in practical application and we are using that for useful range of around 150 to 200 miles.

We intend to install a grid system of communications over the battle areas we fight rather than the old system.

We are experimenting with drones and we hope to be able to develop drone television equipment that will give us a picture of enemy target areas sent back to a command vehicle where a commander may make a decision promptly and call for missile firepower when he needs it.

We have a small squad radio. We are now procuring sufficient radios for an entire division down to the squad.

Here is portrayed one in a helmet, this rather sinister-looking character.

Some of them are two-way and some merely tell him to go get it and he can't talk back.

Radar and infrared is likewise being exploited.

I would like to refer, to be precise in the next chart, sir, to the opening statement which I have here.

I stated at the outset that I planned to present the most significant aspects of the current military situation as background for presentation of the Army's research and development program, particularly in missiles and aircraft.

ROLE OF SURFACE-TO-AIR MISSILES

I believe that I would be remiss if I did not present to you the very significant and increasingly important role of surface-to-air missiles.

In order to do this I would like to use a chart which presents the pattern of effectiveness of surface-to-air fire since aircraft fires fully in combat.

Based upon the technological potential of surface-to-air missiles, as we now understand that potential, the Department of the Army is convinced that missiles will inflict very heavy losses against aircraft in the very near future.

Again we are concerned with the independence of the infantryman in his own combat environment, and we feel that we have a missile family that will give him a large degree of independence.

Now the purpose of this next chart is to indicate how antiaircraft fires as a whole has increased in effectiveness during the past 35 to 40 years.

The statistics on this chart are from our own United States Air Force sources of aircraft losses to air fire in World War II and in Korea.

The chart is intended to portray a trend which we consider particularly meaningful.

I would like to emphasize again that the portrayals of all operational losses, those lost to surface-to-air fires.

I should perhaps say any one sortie may lose 5 to 6 percent of its aircraft, but when the gross totals are brought together at the conclusion of combat, of all losses, those that have been pulled out, these are the statistics as we now have them.

We had no capability in the 1921 period, and at that time it was felt that aircraft completely dominated the battle area.

In fact this was expressed by a number of writers such as Hayes who said nothing that has happened in the history of warfare can affect aerial action.

BY WORLD WAR II, 24 PERCENT OF KILLS FROM ANTIAIRCRAFT FIRE

As a result of our development surface-to-air firing has been able to achieve a 24-percent kill rate against aircraft in World War II.

In the Korean affair in which we were——

Senator SYMINGTON. That is 24 percent of the total kills?

General GAVIN. Yes, sir, due to surface air fire.

Senator SYMINGTON. Not 24 percent of the attacking planes?

General GAVIN. No, sir, I would like to be sure about that one point. We continued to endeavor to improve our capabilities as we approached the Korean affair. There were those who felt that the man on the ground would have little chance against the type aircraft that would be employed against them by the 1950's.

And this was expressed in many quarters. When we got through with the Korean business, our own losses were 38 percent from surface to air fires, and now I quote from the Far East Army's last intelligence summary prior to the armistice in which he stated that despite the United Nations command efforts to disrupt the Chinese Communist Korean supply lines as of that date they were better fed, better prepared to continue hostilities than they had been at any time.

Now we are into the atomic period. We expect that aircraft will deliver rather devastating blows against land forces with atomic weapons. We however have some years back set our course on development of surface to air atomic missiles.

BY 1960'S, SURFACE TO AIR FIRE IMPROVED

We fully believe that we will inflict exceptionally heavy losses against aircraft in the period that we now address ourselves to starting in the 1960's.

The type missiles that will do this in our estimation will be discussed in detail by a later briefer.

I will be followed by General Daley. Before doing so, however, I would like to carefully express several conclusions that we have reached.

ARMY TO BE DECISIVE

First we must aggressively continue our development of our surface to air missile family and in continuation of this development program acquire an antimissile capability.

Second, the role of the man who fights on land with modern equipment and supported by missiles will be of decisive importance in future combat.

Our Nation must acquire the best surface to air and surface to surface missiles if it is to survive.

It must develop an army that can fight successfully in a tactical atomic environment on land in the missile era.

It must have both strategic and tactical mobility to enable it to fly its power when and where needed in support of our national policy and to the degree needed, and finally, we believe that in the missile era the control of the land will be decisive.

MISSILES IMPORTANT

I will be followed by Brigadier General Daley who is in charge of the guided-missiles research and development in the Department of the Army and who will discuss the missile program and development in some detail.

General DALEY. Mr. Chairman, I am General Daley. I am ready to proceed.

Senator SYMINGTON. Fine, General.

General Gavin, is it your pleasure that you would prefer to have the briefings go entirely through before the questions were asked?

General GAVIN. In general, I believe it might be better because they will discuss in considerable detail the number of the missiles and they may cover some of the areas in which you now have questions.

However, I will be glad to respond to your questions, sir.

Senator SYMINGTON. I believe you should do it the way you would have it done. What is the pleasure of the committee on that?

Senator Jackson?

Senator JACKSON. I think they ought to complete the entire briefing because otherwise we are going to anticipate questions that might be covered subsequently.

Senator DUFF. I think it will save time and be much clearer to do it the way the general suggests.

Senator SYMINGTON. Without objection that is the way it will be done.

TESTIMONY OF BRIG. GEN. JOHN P. DALEY, DIRECTOR OF SPECIAL WEAPONS, OFFICE, CHIEF OF RESEARCH AND DEVELOPMENT, DEPARTMENT OF THE ARMY

General DALEY. Mr. Chairman, I have a prepared statement which I would like to follow in large part. However, part of my presentation will be made from charts.

I will discuss with you the Army's guided-missile research and development program. Later experts will cover operational missiles.

Our developmental interests and our actual projects are directed primarily toward our operational requirements, that is surface to surface and surface to air missiles.

I will discuss each of these categories separately.

First, surface to air.

ARMY AIR DEFENSE RESPONSIBILITIES

The Army has definite and clearly established responsibilities in the field of air defense. These responsibilities include not only the defense of the field army and of overseas installations, but also the provision of antiaircraft units including guided-missile units for the defense of the continental United States.

In general, our philosophy has been to develop weapons for use in the field army, and then to adapt these weapons for use in fixed defense.

Accordingly any of our guided missile systems may be used in the field. The Army has persisted in its efforts to maintain the independence of the combat soldier in his own battle environment. To that end we have directed our efforts toward the destruction of any air vehicles or missile traveling through space that would hinder land operations.

ARMY LOOKS AHEAD

The Army anticipated the 1956 threat over 10 years ago and developed the Nike 1 system which will be discussed later by General Gray. It is today the only operational land-based air-defense system capable of meeting the present air threat. We have anticipated the 1960 threat and have projects well along in development; now we are looking toward the intercontinental ballistic missile, confident that we can develop weapons to maintain the integrity and the independence of the land soldier.

ARMY EVALUATES ITS EFFECTIVENESS

In the course of the development of our surface to air missile family, we have destroyed, while in flight, every type of drone, missile, and aircraft that we have been permitted to engage.

In addition, we have persisted in efforts to obtain higher performance drones and target aircraft. Since the Nike program has provided weapons of rather extraordinary performance, this has been a difficult task.

The Army's surface to air guided missile program is comprehensive in scope. (D)

Very low altitude manned aircraft. High performance manned aircraft at high altitude. Cruise type surface-to-surface missiles.

SURFACE TO AIR MISSILES

Air-to-surface missiles. The entire family of ballistic missiles, including the intercontinental ballistic missile.

I would like to refer now to a chart showing our surface to air family. This chart shows graphically our surface to air guided missiles and the threat at which they are directed at countering. (D)

Mr. HAMILTON. Are you going to give us the characteristics of each of these missiles or will that be done later?

General DALEY. I will give you the characteristics and go through each missile individually, sir.

We have the Nike B which is designed to take care of high altitude air breathing missiles. (D)

And also we have the Nike 1 which is a system designed to meet the present threat of manned aircraft. (D)

I would like to take up in classified form each of these surface-to-air missiles. (D)

SURFACE-TO-SURFACE MISSILE

I would like to turn now to our surface-to-surface missiles, including the Honest John, Corporal, Redstone, and Jupiter. The details of this presentation will be in classified form.

The Army's development of surface-to-surface missiles from the first has emphasized ballistic-type missiles, rather than the vulnerable cruise-type air-supported missiles.

To the Army, with its years of background of artillery experience, this has been a rational approach. Our development efforts are directed toward all weapons required by an Army commander in the field.

These include short-range assault missiles of great accuracy, and antitank missiles, and missiles to extend the artillery's all-weather, day or night fire-power, missiles needed in the highly mobile, fast-moving, deeply penetrating, widely separated combat actions of the future. (D)

Senator SYMINGTON. What is the Mach of 2,000 feet a second?

General DALEY. At sea level this would be about a Mach of 1.8, I would guess. Would somebody verify this?

Senator SYMINGTON. If it is not right, change it for the record, will you?

General DALEY. Yes, sir.

Senator SYMINGTON. General Gavin, Senator Saltonstall said he was very anxious to hear General Brentnall; so we put General Brentnall off until 11 o'clock.

We will continue through this interesting and instructive briefing, and when Senator Saltonstall comes in, General Brentnall, we will proceed with your presentation.

Senator Saltonstall said he would be here by 11 o'clock. If that meets with your approval, that is the way we will proceed. (D)

ARMY PLEASED WITH ITS MISSILES

General DALEY. I have shown you the weapons that we are developing. We are proud of our guided-missile development and our operational accomplishments. We believe we have established a great national reservoir of developmental, operational, training, and organizational guided-missile know-how.

The Army recognizes that each service has a need for guided missiles. The Army is making a maximum effort to develop, produce, and bring into operation all the several kinds of guided missiles it requires.

Our developmental teams in industry and in our arsenals have, without qualification, the greatest operational and developmental guided-missile experience in the Western World, and we hope in the entire world.

In closing I would like to stress two major points about the Army's guided-missile-development program.

First, we are confident that we can achieve a successful counterweapon against ballistic missiles, including the intercontinental ballistic missile in time to meet the described threat of 1960 or 1961.

Second, we are confident we will achieve the first 1,500-mile ballistic-missile capability in the Western World.

This concludes my discussion.

Senator SYMINGTON. Thank you very much, General.

COMMITTEE PROCEDURE

Senator Saltonstall, we postponed General Brentnall until 11 o'clock, and we were glad to go through with the briefing that has just been given us by General Daley.

If it is all right with you, we have had General Brentnall now for 2 days, and we would like to go ahead with that briefing.

Senator SALTONSTALL. Mr. Chairman, you go ahead with the general and I will pick it up from the members of the committee afterward.

Senator SYMINGTON. Fine. We will do the General Brentnall briefing now.

Senator JACKSON. Could we ask some questions on this part of it?

Senator SYMINGTON. We have more. Of course, General Brentnall, it is just as cool over here as it is in the Pentagon, if you would stay.

General BRENTNALL. I have work over there, too, sir.

Senator SALTONSTALL. Mr. Chairman,, may I ask what your plans are?

Senator SYMINGTON. We postponed the briefing of General Brentnall until 11 at your suggestion.

You, however, said you were interested in hearing General Brentnall especially, so we postponed General Brentnall until 11 o'clock.

If he gives the briefing now, he cuts in on the missile briefing of General Gavin.

Senator Jackson mentioned the question-and-answer period. We will do whatever you would like.

You have sort of steered the chronology this morning.

Senator SALTONSTALL. Mr. Chairman, I am sorry I was not able to get here sooner for the reasons I have already given.

Senator SYMINGTON. I presented that to the committee.

Senator SALTONSTALL. I am awfully sorry to say I have got to leave now. Are you planning to meet this afternoon?

Senator SYMINGTON. Yes, sir; we will meet this afternoon at 2 o'clock.

Mr. HAMILTON. I should say to Senator Saltonstall and explain to the chairman the thing he evidently did not know.

Mr. Rhodes reported to us that you did not desire to have the hearings put in any confusion at all by your desire to hear General Brentnall, and I would like that to be shown.

Senator SYMINGTON. Now, General Brentnall, you were here at 11 o'clock.

Would you like to continue to listen to this briefing or would you like to give your briefing now based on your time problem?

Whatever you say. I think the committee owes it to you to have you make the decision.

General BRENTNALL. I would like to get it over with so I can go back to work, sir.

Senator SYMINGTON. Will you go ahead?

General BRENTNALL. Whatever fits in with your plans.

Senator JACKSON. Mr. Chairman, I ask unanimous consent, in order to keep the record in some semblance of order, that General Brentnall's testimony be separate from the testimony from the Army so the question period will not mix the two together.

Otherwise it will be rather difficult to follow. I would suggest that after we finish your testimony, General, we ask the questions and then go back to the Army's presentation for interrogation if that is not out of order.

I think it would be more helpful.

Senator SYMINGTON. That is a good suggestion.

Mr. HAMILTON. Senator Jackson, do I understand that your suggestion is that General Brentnell's testimony be put, so to speak, ahead of this whole line of testimony?

Senator JACKSON. Just so we have the continuity.

Senator SYMINGTON. Suppose we do it this way based on what General Brentnall just offered. Suppose we have the hearing at 2 o'clock this afternoon. Perhaps Senator Saltonstall can make that, and you can come back at 2 o'clock. We could then proceed with the Army briefing.

General Gavin, we are at your service.

What is the next briefing?

General GAVIN. Fine, sir. I anticipated possibly some questions but this will be fine.

Senator SYMINGTON. Are we now ready for questions?

General GAVIN. We are ready for the next briefing.

Senator SYMINGTON. In accordance with the committee's procedures we will turn the first questioning over to the counsel.

Mr. HAMILTON. You want to have questions now as I understand it, Mr. Chairman?

Senator SYMINGTON. I understand General Gavin would.

General GAVIN. No, sir. I understood Senator Jackson——

Senator JACKSON. I had a couple but that does not matter. What is the next item on the briefing?

Senator SYMINGTON. I think we ought to complete the briefings. That is the way we started out.

General GAVIN. Let us complete the briefings now.

I think it would be better.

Senator SYMINGTON. Yes; let's complete the briefings now.

General GAVIN. General Medaris on the Jupiter program.

TESTIMONY OF MAJ. GEN. JOHN B. MEDARIS, COMMANDING GENERAL, ARMY BALLISTIC MISSILE AGENCY, REDSTONE ARSENAL, ALA.

General MEDARIS. Mr. Chairman and gentlemen, I do not have a fully prepared statement. If you will bear with me I would like to very briefly summarize the position of the Jupiter program working from informal notes.

To understand the position of the Jupiter development program in the Army today, it is necessary to recognize that the background goes back to about 1938 and 1939, at which time a group of scientists and engineers in Germany were taking the maximum interest in the program of free and guided rockets.

Their initial primary interest was space travel. There was at that time not much interest in this country in that particular field.

Beginning in 1939 a group of these people were assembled by the German Government and put to work to develop an operational weapon from the rocket system.

Senator SYMINGTON. Excuse me, General, for interrupting. We have here a paper that has been submitted called Army Employment of Jupiter, as presented to the subcommittee on the Air Force of the Senate Armed Services Committee May 22.

General MEDARIS. That is not my presentation.

Senator SYMINGTON. That is what I was asking.

Do you want this made a matter of the record?

General MEDARIS. That is a later item on the record.

General GAVIN. This, Senator Symington, is a later presentation on the employment of Jupiter.

This is the development program of Jupiter that he is now giving.

Senator SYMINGTON. Thank you. That clears it.

DEVELOPMENT OF THE JUPITER MISSILE

General MEDARIS. This group of scientists was set up at Peenemunde by the German Government and went to work on rockets; missiles as a weapon.

They were not given any opportunities to do much of the basic scientific research and careful development necessary to proof out reliability and the maximum correction of errors, since they were given the sole objective of getting a missile in the air that would fly and would deliver a payload somewhere into a target area, and they were given plenty of latitude in that.

NAZI V–2

The result of their efforts was the V–2. The V–2 had a circular probable error, if we can call it that, of about 25 by 35 miles, within which 50 percent of those that got off of the launching area landed.

Only 60 percent of the total history actually managed to get well off the launching area, and Dr. von Braun very accurately but rather facetiously makes the statement the object of the exercise for some time was to make it more dangerous at the target area than it was at the launching site.

But they were directed very specifically not to make careful investigations, that they had one single objective and that was to get a missile in production, that its deficiencies and errors would be accepted, but it had to go into production.

At the close of the war, as I think is familiar to most everyone, the majority of that team came toward the West in front of the advancing Russians, and through United States Army agencies was screened out to yield 130 what were considered to be the top scientists, the most advanced technicians in the field of guided missiles.

In the following 5 years from 1945 to 1950, that group had to go back and catch up with all the work that they should have done while they were developing the V–2, but which they had not been allowed to do and to make the basic investigations that are essential to sound continued progress in the missile field.

During that same time interest had been aroused here in the jet propulsion laboratory operated by California Institute of Technology, had proposed a program of liquid-propelled rockets which began as an altitude research program with the Corporal missile, for our purely high-altitude research purposes.

During this period then, 1945 to 1950, Dr. von Braun and his group through assembling and firing under carefully controlled conditions V–2s that had been brought over here from Europe and continuing with elements of Hermes project were able to develop those basic requirements for sound development of heavy, medium and long range ballistic missiles that are essential to the progress being made today.

STUDIES TO IMPROVE OVER V–2

Among those things were a determination of what influenced reliability and how it could be built into missiles, since you cannot arrive at the statistical basis for determination of reliability but you do by firing 10,000 rounds of artillery, for example.

What with the primary elements of guidance, how could accuracy be achieved, which was the major defect in the earliest missiles, and what were the most important means, best means, by which maximum information could be gained from each missile flight.

One of their great troubles with Peenemunde had been when something went wrong they had little or no basis on which to determine what had gone wrong.

The missile had gone, something had gone wrong, they had to go through a process of speculation to determine what. So during those same years instrumentation of missile ranges was developed to a point where, for example, in the last firing of the Redstone missile there were 141 channels of information that were telemetered back and gotten on tape of exactly what happened inside of the missile during its flight.

I think you will recognize in a few things I mention later the importance of those elements.

Later in time the Corporal program was reoriented to bring about the first operational ballistic missile about which you have already been told. (D)

In the meantime Dr. Von Braun's group had established the capability of a system to develop the required accuracy, had in fact developed certain elements of such a system which made it evident that the system could operate with absolute freedom from outside interference. (D)

So that reliability and accuracy then became possible of attainment because the basic facts were known.

THE REDSTONE PROJECT

Now in 1950 the Redstone project was started as the first pointed development project of this team to develop a weapon. (D)

I am sure that the committee has been enough into the missile business to recognize that everything revolves around the ratio of payload and range, that is as you reduce payload it is easy to increase range and actually if you had zero payload you could get infinity of range almost. (D)

So that the changes that subsequently took place had an influence on the development of the Redstone. (D)

The first Redstone was fired in 1953. Now in 1954 the Killian Committee made a study of the missile situation as far as medium- and long-range missiles were concerned, came up with the conclusion that it would be much easier and have much greater assurance of success to develop a 1,500-nautical-mile missile than to rely entirely on the prospects of the ICBM, the 5,000-mile missile then in various stages of development.

There were many reasons for that. There are barriers that are crossed in the intervening distance there that have a vast influence on the ability to resolve problems in the missile field.

Differences in reentry speeds bring one into a whole different field of physical sciences or, I should say, a wholly different area of resolution. (D)

IMPORTANCE OF OUR FOREIGN BASES

It was not part of the Killian Committee's determinations, but I think it is reasonable to interject that there was some influence in the thinking by the fact that under our present circumstances the 1,500-nautical-mile missile in the hands of the United States is almost the equivalent of an intercontinental ballistic missile in the hands of Russia, Russia being required to fire from a central position whereas we have the base areas that can be used around them.

The Killian Committee also made a very particular point of the requirement for both sea-based and land-based use of this 1,500-nautical-mile missile.

Summarizing the position in 1955 then, the Army had arrived by logical and careful progression at a point where the basic problems of ballistic missiles were known and their resolution pretty well established.

Most of the problems had been solved in one way or another, solutions had been tested for them and it was known that they could be solved.

FIRED MORE THAN 500 BALLISTIC MISSILES

We were out of the point where a major breakthrough was required to resolve those problems. By that time the ballistic missile team, now under my command, Dr. Von Braun's team, had fired or supervised the firing or had been responsible for the firing of over 500 ballistic missiles.

By that time a considerable number of Redstones, an advanced ballistic missile using what they had learned, had been fired, with only one complete failure, the others being successful.

RELIABLE GUIDANCE SYSTEM

By that time they had resolved the problems of guidance and developed many of the required components for a reliable guidance system independent of outside interference.

CORPORAL, FIRST OPERATIONAL BALLISTIC MISSILE

By that time the Army, through all its resources, had come up with the first operational ballistic missile, the Corporal.

The flights of the Redstone had been spaced out and had proven out to our satisfaction, at least, the virtues of the careful approach to development, of getting the maximum out of each ballistic missile flight rather than firing a lot of them just to see what happens. It was obvious at that point that there was a next logical step, and of course the Killian report pointed the way to the next logical step. (D)

ALL SERVICES INTERESTED IN 1,500-MILE MISSILE

In 1955 all 3 services made proposals for the development of a 1,500-mile missile.

On the 8th of November the decision was made by the Secretary of Defense and one project for a 1,500-mile missile was assigned to the Air Force, for a land-based version; one project was assigned jointly to the Army and the Navy with the respective responsibilities of the two services delineated, that the Army would be responsible with its skilled crew and background of experience for the development of the missile system, and the land-based application as an alternate to the Air Force project, the Navy being responsible for the development of the ancillary equipment and adaptations required to make the missile usable from shipboard, the Army being strictly charged with bringing the missile on in such a way that it could be used from shipboard, and that is a very important element of our development work today. Things moved rather rapidly after that. This was a joint project at the departmental level and a joint committee was formed to direct it. At the operating level, however, the mission separated itself well.

The Army Ballistic Missile Agency was directed to be formed, and I was designated to command it when it was constituted, and immediately in November took control of the project.

REDSTONE, BACKUP FOR JUPITER

The project is both the Redstone and the Jupiter because they are indivisible. One supports the other. The Redstone project supports

the Jupiter project. I would like to say just briefly that in the constitution of the organization, the Army was very conscious of the Secretary of Defense's directive that the methods to be used should involve maximum urgency, and the organization that was set up to handle this program reflected that directive and there was delegated to me personally responsibility for the success of the mission and likewise there was delegated to me everything that the Secretary of the Army could legally delegate to the field, to anyone other than his own people, in the way of authorities to proceed with the program.

LIAISON, THROUGH COMMITTEES

In order that there be no loss of knowledge in this program anywhere and that it fit into its proper objectives, there has been developed a very widespread and comprehensive system of liaison.

There are a series of joint technical committees in which my organization participates with people from Admiral Radford's organization in the Navy charged with the Navy portion of this mission, Admiral Raborn, I am sorry, let me correct that, and in those technical committees all the points that influence the ability of the missile to be useful from a ship-based launching platform are thrashed out and settled and worked out so that they are compatible with the Navy's needs.

It is a very obvious fact that any missile that can be successfully fired from shipboard will make a good land-based missile, but the contrary is definitely not true.

We have run into no blockades, however. It is going forward very smoothly and every problem that has been posed so far, the solution to the problem has become obvious and clear and one that can be used.

In addition to our liaison with the Navy, we have a liaison system with the Air Force through which we expect to get information as to what they are doing so that we will not duplicate the lines of exploration, experimentation that the Air Force is carrying forward in their intermediate range missile.

And they likewise have a liaison officer at my headquarters to whom is made available all the technical information on our progress, so that we in that way avoid duplications of investigations in otherwise problem areas.

In summary, the Jupiter was not taken off from a standing start.

FROM THE REDSTONE TO THE JUPITER

First of all many of the components to be used in the Jupiter are already proven components, proven in the flight testing of the Redstone.

Second, and a very important part of the program, is the fact that Redstone hardware was already available through the Redstone program to carry as passengers components required for the Jupiter and give them the flight tests required before they would be used in actual flying missiles.

A great deal of time was bought by that, because that hardware was already made, the schedules in being. All we had to do was include an angle of attack meter which is not needed for the Redstone but is needed for the Jupiter but it was proven tested in the flight of the Redstone.

So that hardware gave us a very great advantage.

PROBLEMS SOLVED

Furthermore in attempting to resolve the problem of reentry which is not too severe at the reentry velocity of the intermediate range missile but is still a problem area since the conditions cannot be duplicated in the laboratory, it can only be resolved by flight tests, in resolving that we were able to buy time because by combing hardware available for the Redstone as a booster system plus engineering and experienmental work that the Jet Propulsion Laboratory had carried forward, we were able to come up with a composite missile that would be able to create the reentry velocities necessary to test a reentry head at a much earlier date than it could properly be tested on a prototype missile. (D)

The fact that we have hardware on order and engineering completed in other projects contributed substantially to the assurance of success of the Jupiter program. And in fact the Jupiter program is simply an extension of known principles with the same development team that has worked together before for a considerable period of time, and in fact using the same contractual team, the same industry team that is supporting our Redstone member and is building their way in and has been now trained in conjunction with our people for a matter of about 4 years.

So there is a long running head start. Our schedule as I mentioned, indicates that we will fly the reentry system, we will continue the flights of the Redstone as they previously have been scheduel, but each Redstone will carry some mission for exploration for the Jupiter, some component, some element of Jupiter requirements are tested on each Redstone flight. (D)

I believe it is appropriate to mention something of our philosophy of development in order that those dates may fall into their proper perspective.

FIRINGS FEW, PROGRESS SUBSTANTIAL

There are differences. There are several ways to develop things. The particular philosophy of development that we believe to be the most appropriate and the most useful contemplates the maximum progress with each missile fired.

These missiles are expensive, and to assure maximum progress with each missile fired it means that initially as you are beginning your early investigation, your firings must not be too close together because you must be able to reflect what you found out from one in the next one before you fire it.

Otherwise you will just be shooting a duplicate of the one you did shoot.

As you know more and as you get more reliability and more assurance in the elements of propulsion and control, you can then speed them up and still get the reaction that you need but your whole key to your speed of firing is based on how fast can you make use of what you learn from each firing, how fast can you resolve that in terms of getting more out of the next one.

At certain stages you run into the point where you can fire two without doing much in between because they are fired with two different sets of missions but that is much further along in the program.

Our philosophy also believes that absolutely maximum ground testing and laboratory testing of the parts, components, matching, mating and actions of the missile on the ground is essential if we are to get our money's worth out of a flight.

Again the question is, a flight costs a lot of money and we hope to have always maximum assurance that the flight will be successful before we fly it.

But that means as much as 4 months of static tests with the complete missile, simulated firing run through electronically with all the operation of the missile components, complete test and checkout of everything in the missile before it is finally fired, but perhaps that philosophy may have justified itself, for example, in the Redstone program by the fact that there was only one failure out of the missiles fired to date, and that for reasons that would not well develop in ground firing at any time.

This system uses less total missiles to arrive at an operational capability, has a slower firing schedule, but we believe gives an operational capability at an earlier date than is otherwise possible.

ARMY OPTIMISTIC

Since November things have moved along very rapidly. The organization is complete, the program is in hand. We can see the evidences of our work in terms of hardware, prototypes.

The crescendo of effort in the organization is obvious.

We will not take a panic approach but we are working under maximum urgency, and we are quite sure we are going to come along as good or better than our schedule anticipates in producing a true operational capability for both the Navy and land-based use.

Thank you very much, sir.

Senator SYMINGTON. Thank you, General Medaris.

I have known General Medaris for many years. His reputation is that of one of the ablest officers in the Army, or of the other services.

It was a fine presentation.

General MEDARIS. Thank you very much, Senator.

Senator SYMINGTON. I hope it comes true the way you gave it.

I believe it would be of great help to the security of the country.

General MEDARIS. We have every confidence, sir. The reputation of the individuals involved in this and of their past achievements make us feel that we are all right.

Senator SYMINGTON. General Gavin, we will go to 12:30 and reconvene at 2 o'clock.

I might add we will be very glad to have you back when General Brentnall is here. I don't quite know the length of his briefing.

General Musgrave, do you?

General MUSGRAVE. No, sir; I do not. I think probably 45 minutes.

Senator SYMINGTON. We will see you at 2 o'clock then. And any members of your staff that you would like to have present.

General GAVIN. All right, sir. You intend to go to 12:30 now?

Senator SYMINGTON. Yes; I think we could go to 12:40.

General GAVIN. The next presentation very logically follows this. It has to do with the employment of this Jupiter missile.

Senator SYMINGTON. I don't want to be presumptuous here. What is the pleasure of the committee?

Is 12:40 all right?

Senator JACKSON. I have to leave at 12:25 but it won't matter.

Senator SYMINGTON. Is it all right, then?

You could read the record.

Senator JACKSON. Yes; I have heard some of the testimony before.

Senator SYMINGTON. Can you be back this afternoon?

Senator JACKSON. Yes.

General GAVIN. This should take about 20 minutes, sir. It is actually abbreviated somewhat from the written material that you have in your possession.

Senator SYMINGTON. You have 45 minutes now so go right ahead. The more you give us, now that we have you here the better we like it.

General GAVIN. That suits us.

Colonel DALRYMPLE. Major Wardlow will give the presentation, and I will assist him.

TESTIMONY OF MAJ. RALPH C. WARDLOW, PLANS BRANCH, PLANS AND PROGRAMS DIVISION, OFFICE, CHIEF OF RESEARCH AND DEVELOPMENT, DEPARTMENT OF THE ARMY

Major WARDLOW. My name is Major Wardlow, and I will read the presentation.

Mr. Chairman and gentlemen, the purpose of this briefing is to present the Army's requirement for, and concept of, employment of Jupiter, the 1,500 nautical mile ballistic missile.

As a background for a discussion of the requirement of Jupiter in the 1960–70 period, we must first examine the nature of future war as it pertains to the employment of Jupiter.

CHARACTERISTICS OF NUCLEAR WARFARE

Future land warfare in which nuclear weapons are employed or where their employment is threatened will be characterized by:

1. Dispersal of units and installations in width and depth to reduce their vulnerability.

2. Mobility, both ground and air, to permit rapid concentration of combat power.

3. Firepower of increased range and lethality including missile delivery systems unaffected by weather, visibility, or the level of air defense effectiveness expected against aircraft.

4. Efficient and reliable communications to permit control of widely dispersed, highly mobile forces.

In future war the deep penetration of enemy forces into allied controlled areas must be accepted as normal since mobile offensive forces cannot be stopped until the dispersed defensive forces can concentrate, through mobility and firepower, the combat strength necessary to oppose, and eject, or destroy the penetrating force.

Offensive operations will include deep ground and airborne penetrations and exploitations of nuclear weapons and will be planned to proceed rapidly to the seizure of a strategic objective. The former

pattern of slow progression through successive objectives to the seizure of a strategic objective will be outmoded in the face of nuclear weapons.

The outcome of each operation requiring the concentration of forces for its execution will be so important that the highest attainable capability for its success must be available. This capability will be furnished chiefly by highly mobile airborne and ground forces and their supporting firepower.

Firepower in support of ground operations must possess two principal characteristics, regardless of the vehicle by which it is delivered, be it gun, aircraft, or missiles. First, it must be capable of supporting the scheme of maneuver. Secondly, it must be completely responsive to the needs of the ground commander and available at the time and in the quantity required.

JUPITER MISSILE

Jupiter, as shown on this chart, is the newest member of the Army's artillery family for the delivery of this vital firepower.

The gains from the inclusion of Jupiter are most readily seen from an example of a concept of its employment. (D)

If a general war is initiated by the Soviets with an atomic onslaught, the first phase will be characterized by an intensive exchange of atomic blows and a determined defensive operation to maintain allied positions in Europe and the Far East.

INITIALLY ARMY HAS GEOGRAPHICAL HOLDING MISSION

The principal Army mission initially will be to hold the enemy along certain geographical features or boundaries thereby retaining maneuver area into which we can subsequently deploy offensive forces. (D)

ADVANTAGES OF JUPITER MISSILE

In summary, I would like to stress the following advantages of Jupiter employment.

1. The range and accuracy of Jupiter permits support of the senior Army commanders' scheme of maneuver to the depth required from relatively few firing positions without complex and fixed installations.

2. Vulnerability to enemy action is considerably reduced by the employment of Jupiter as described in this briefing. The location of launching sites several hundred miles to the rear of areas of contact, and the mobility of the system allow dispersion, while retaining the capability to support Army Forces with great firepower. Further, since Jupiter units will be high priority targets, they must be provided with protection from all forms of attack. This will require Army air defense and ground defense forces.

3. Jupiter adds flexibility and reliability to the firepower available to support Army forces. Not only can Jupiter supplement and extend the range of existing Army weapons systems, it also provides the ground force commander with a nuclear delivery system, completely responsive to his scheme of maneuver and unaffected by weather, visibility, or known air-defense measures.

4. The logistics required to support Jupiter are minimized by the location of launching sites outside the immediate battle area and can be most economically provided by taking advantage of existing or projected supply routes and bases. The introduction of Jupiter will not require logistic support of a type not now required for other Army weapons systems.

5. New skills required for personnel operating a Jupiter battalion are not basically new to the Army. The skills required are generally the same as those required in the firing of other Army missiles. (D)

ARMY HAS LAND BATTLE RESPONSIBILITY

In conclusion I want to emphasize that it is the senior Army commander who is responsible for the success of the land battle and who is in position to properly evaluate the effects of nuclear weapons delivered in support of his scheme of maneuver and within proximity of his troops.

In the confused and fluid situation of future war the ground commander cannot entrust to other agencies the destruction of vital targets which endanger accomplishment of the ground mission or the lives of his troops. Therefore, he must have under his control and directly responsive to his need all the firepower necessary to support his operations. He must not be forced to depend for support on a "when-not-otherwise-employed basis" from another commander who is primarily engaged in the sea or air battle.

This concludes my briefing.

Senator SYMINGTON. Thank you, Major. That is a very interesting briefing.

Senator JACKSON. Mr. Chairman, I will be here at 2. I have some people waiting. We will be able to ask questions of the Army at that time? They will be back at 2?

Senator SYMINGTON. General Brentnall will go on at 2.

Senator JACKSON. I thought he was going on at 2:45.

Senator SYMINGTON. No; at 2, and the Army will go on at 2:45, so we will have the interim, or thereabouts, whenever he is through.

General Musgrave guessed he would go a half hour. Then we will have the counsel question; and then we will turn it over to the committee.

General Gavin?

General GAVIN. Mr. Chairman, we have 2 briefings of approximately 20 minutes each. The first is on the antimissile missile which I believe you will find most interesting. If you are ready for it, we can put it on now.

Senator SYMINGTON. Let's put it on. While we are waiting for that briefing, I have one comment.

I notice in the briefing that on the last page the word was read "visibility or air-defense measures," and the major said "visibility or known air-defense measures" in his briefing. If we can get a handy ballistic missile, we must assume that the enemy can, too. Right?

General GAVIN. That's right.

Senator SYMINGTON. Do you see what I am trying to get at?

General GAVIN. Surely.

TESTIMONY OF LT. COL. WOODROW B. SIGLEY, CHIEF, AIR DEFENSE BRANCH, MISSILES AND AIR DEFENSE DIVISION, OFFICE, CHIEF OF RESEARCH AND DEVELOPMENT, DEPARTMENT OF THE ARMY

Colonel SIGLEY. I am Colonel Sigley.

Senator SYMINGTON. How do you spell that, sir?

Colonel SIGLEY. S-i-g-l-e-y.

During this discussion I will outline to you the Army's program for development of an antimissile missile system.

ARMY MISSION TO PROVIDE DEFENSE WEAPONS

The Army, by its assigned mission, is responsible for providing the antiaircraft weapons for the defense of the continental United States, field armies, and vital overseas installations. In successfully carrying out this mission, the Army has worked in the field of ground to air-weapons development for the past 40 years.

Senator SYMINGTON. Have you copies to follow with our eyes?

Colonel SIGLEY. I believe the committee has been provided with them.

Senator SYMINGTON. We haven't them. You go ahead though.

ARMY CONFIDENT AND OPTIMISTIC

Colonel SIGLEY. In 1953 the Army foresaw the forthcoming threat of the ballistic missile. The Army initiated studies at that time with the objective of developing weapons systems capable of successfully attacking those missiles. We fully realize the seriousness of the threat and fully appreciate the magnitude and complexity of the problem. However, in the light of our experience, and as a result of the studies which we have conducted, the Army is convinced today that it can development systems to counter the ballistic missile. (D)

THE ARMY'S ANTIMISSILE MISSILE PROGRAM

The Army welcomes this opportunity to discuss its antimissile missile program with you. (D)

As you well know, Nike I is presently in the field and operational. It provides an excellent defense capability against any targets which might be encountered today or in the very near future. This ready capability is very important to our country's defense. However, even more important is the background of research, development, manufacturing, and test experience of the Army and its contractors, plus the wealth of operational and maintenance experience developed over the course of the Nike program that are applicable to the air-defense problems of the future. In fact, the basic Nike system concept and the details of its implementation are directly extensible to the solution of those future problems.

NIKE PROGRAM A SERIES OF ANTIMISSILE STEPS

The Nike program can be looked upon as a series of logical steps in the advance of our surface-to-air missile capability, each step building on the preceding ones. It is important that each step be considered

very carefully from the standpoint of the state of the art and improvement in capability obtained. If the steps are too small, the limited increase in capability provided will not justify new operational equipment. On the other hand, steps which are too ambitious can delay for an unreasonable length of time the attainment of a significant improvement in capability thus keeping our defense too far behind the state of the art.

The Nike B system appears to be a logical and well-balanced step in this evaluation. (D)

OPTIMISTIC SUMMARY ON ANTIMISSILE MISSILES' FUTURE

To summarize my remarks concerning the antimissile missile program, I wish to make the following conclusions:

First, the Army considers that the development of a defense against ballistic missiles is a program of major national importance and should be pursued with urgency.

Second, the Army considers that systems for defense both in the CONUS and the field army are feasible. Further, the Army believes that development may indicate that one system will do both jobs. (D)

Third, the Army has underway today an aggressive antimissile missile program and hardware component development has been initiated on those components on which we know the success of the system will depend.

Fourth, the Army believes that it is possible to provide an early anti-ICBM capability.

Sir, that completes the briefing.

Senator SYMINGTON. Thank you for an interesting briefing, Colonel.

General, we will meet you back here this afternoon.

(Whereupon, at 12:45 p. m., the committee recessed until 2 p. m., the same day.)

AFTERNOON SESSION, TUESDAY, MAY 22, 1956

[General Brentnall's testimony was taken at this time. It appears in vol. VIII of the printed hearings.]

Senator SYMINGTON. General Gavin, will you take over again, please, sir?

General GAVIN. Mr. Chairman, the Army has one remaining presentation to make this afternoon, to be made on the missiles now in operational use in the United States Army, and it will be made by Brigadier General Gray of the Operations Division of the Department of the Army.

TESTIMONY OF BRIG. GEN. DAVID W. GRAY, DIRECTOR OF OPERATIONS, ODCSOPS, DEPARTMENT OF THE ARMY

General GRAY. Mr. Chairman, I am General Gray, Director of Operations, Office of the Deputy Chief of Staff for Military Operations. I will discuss the Army's operational missiles.

OPERATIONAL SURFACE-TO-SURFACE MISSILES

The Army has two operational surface-to-surface missiles: The Honest John and the Corporal. They are relatively short-range

weapons, both capable of delivering atomic warheads on targets in the zone of action of the Army in the field.

The Honest John is a rocket which is aimed in direction and elevation before it is launched, and once launched, its course cannot be corrected since it is not equipped with a built-in guidance system. It would normally be used against such battlefield targets as troop and supply concentrations, command and communication centers, bridges and defiles.

The second surface-to-surface missile, the Corporal, is launched vertically into the air and then guided to the target by radar commands from the vicinity of the launching site. This missile will ordinarily be used against troop concentrations, bridges, marshaling yards, and supply and communication centers. (D)

NIKE

With respect to surface-to-air missile, the Army has Nike, the only fully operational surface-to-air missile in the world today. (D)

Senator SYMINGTON. This is Nike what?

General GRAY. Nike I.

Senator JACKSON. That is the one in operation?

General GRAY. That is the one in operation.

It is launched from a simple rail-type launcher. Principally, in order to reduce real-estate requirements, the Army has adopted an underground type of storage system with a combination elevator and launcher which is supplemented by three above ground satellite launchers. This arrangement is called a box.

A battery as deployed in the United States consists of a launcher area wherein three of these boxes are located, and the control area consisting of radars, control vans, and generators. Troop housing is also located within these two areas. Safety restrictions require a minimum of 43 acres for the launching area and 8 acres for the control area. Operational requirements of Nike radars require a minimum distance between the radars and the launchers of 3,000 feet. This distance requirement is one of the reasons why Nike cannot be used aboard ships. (D)

The other fact is that much of this equipment is mobile and does not need construction to house it. In this connection, all Nike equipment is designed to be mobile and so can be used interchangeably in fixed defense or with the field army.

NIKE COMMAND GUIDANCE SYSTEM

The Nike utilizes a command guidance system—this means one radar tracks the target while another tracks the missile. The data from these two radars is fed to a computer which corrects the missile's flight and transmits commands to the controls in the missile. These, in brief, are the principal operational aspects of the missile.

NIKE BATTERIES DISPERSED

With respect to its employment, the batteries are generally dispersed around the defended locality in an elliptical pattern and at such a distance from each other so that all the airspace at maximum

range can be reached by at least one battery. At closer ranges, 6 to 8 batteries will cover all airspace. Distances will vary, but this pattern generally locates the batteries an average of 15 miles from the center of the defended locality.

DEFENSE MISSIONS AS SEEN BY ARMY

Next, I will explain to you how the Army, through its Antiaircraft Command, has attempted to apply this concept of defense of the overall antiaircraft defense of the United States. The Antiaircraft Command, that is ARAACOM, is the Army component, which along with the Air Defense Command and the naval forces' CONRAD, form the Continental Air Defense Command. Reduced to the simplest terms, under CONAD the Army has had the responsibility for air defense by missiles fired from the ground at targets in the air. The Air Force has the responsibility for manned interceptors and the Navy responsibility for the sea approaches.

ENEMY OBJECTIVES

The Army's concept for defense has been based primarily on what are considered the enemy's key objectives in the United States. As shown on this chart, these are: (1) Key industrial and population areas, locks, seaports, and communication centers; (2) atomic-energy installations; and (3) strategic airbases.

Studies conducted by the Operations Research Office of the Army have developed a means for calculating defense requirements in these areas. Using these studies, the Army has developed and is now implementing a plan approved by the Secretary of Defense to deploy Nike battalions located in areas shown on this chart.

Each circle represents a defense area which contains one or more battalions. (D)

DEFENSE NOT YET COMPLETED

I would like to point out that this is not considered an adequate or complete defense and that plans are being prepared for additional battalions needed to provide a minimum acceptable level of defense both in the United States and for United States forces deployed overseas. (D)

The final aspect I would like to mention is to indicate to you the magnitude of effort involved when a service undertakes a specific function such as this. It is not merely a matter of battalions or batteries dispersed around cities. In the Army's antiaircraft command there are the following specific elements:

COMPLEX PROGRAM

(1) The basic command structure of five defense regions under the antiaircraft command; (2) the logistic support organization of the Army commands, comprised of the elements of the technical services who must warehouse, ship, and maintain the equipment peculiar to Nike; (3) taking a closeup of a single defended area, the group and brigade headquarters required to command the battalions; (4) also within each locality, the antiaircraft operations center necessary to

give fire direction to the batteries; (5) also taking a close look at the Fort Bliss enclave, it can be seen that it includes the schools for training specialists, firing ranges for all the battalions, a research and development board, and training units to supply personnel for the forces in the United States as well as those overseas; (6) and finally there must be a career field for both officers and enlisted men, as this element of the Army is sufficiently highly specialized to require long-term, continuous assignment to it. This complex structure is what is required to support the antiaircraft function of the Army.

ARMY RATES ITS MISSILE PLANS AND CAPABILITIES

In summary: (1) The Army has had on-site and operational Nike battalions in the defense of the United States since 1954; (2) plans are now being prepared for a later expansion of this program; (3) the Army has already developed the firm overall base on which, with minimum additional cost, with no gaps in the effectiveness of the present defense system, and in a logical and orderly transition it will be able to provide at minimum cost a defense that will be able to keep pace with the increased capabilities of its possible opponents. (D)

Senator SYMINGTON. Thank you, General.

In accordance with the rules set down at the first hearing, Mr. Counsel, I suggest you interrogate for a period, say 30 minutes.

It is my understanding, General Gavin, that General Medaris would like to testify first.

General GAVIN. Yes, sir. If it would please the chairman, I would prefer that he be questioned first. He has recently had a very serious operation, he is actually on a convalescent status now, but I thought it would be well for him to be here. It would be most considerate if you could hear him first.

There may be questions after he leaves in his area of responsibility, and I believe the remainder of us here could handle those anyway.

Senator SYMINGTON. General Medaris, I suggest you take a seat a little closer.

General GAVIN. Were any charts used with General Medaris' briefing?

General MEDARIS. None, sir.

Senator SYMINGTON. It is a big dose you have given us today, and it is hard to absorb it all. If you have charts available as the questions come up, I think it might be a good idea to have them available.

General GAVIN. We have some here.

Senator SYMINGTON. Will you proceed, Mr. Counsel.

Mr. HAMILTON. Yes.

JUPITER HISTORY

General, as I recall it, the Jupiter project was set up in November, 1955?

General MEDARIS. It was assigned to the Army November 8, 1955; yes, sir.

Mr. HAMILTON. How does it happen that it wasn't set up earlier?

General MEDARIS. As I believe I mentioned this morning all three services had made proposals for developing the medium-range missile.

Mr. HAMILTON. When did the Army make its first proposal, do you recall?

General MEDARIS. It was in July, if I recollect correctly, July or August.

Mr. HAMILTON. 1955?

General MEDARIS. I don't know the exact date. But the decision was finally rendered by the Department of Defense on November 8.

Mr. HAMILTON. Was it the case that the Army was not interested, or very much interested in the Jupiter type of missile until July 1955?

General MEDARIS. Not at all.

Mr. HAMILTON. Was it just that you thought you hadn't gotten to the point before then when you could go after it?

General MEDARIS. There were two things, I believe, that influenced the timing. One, as I mentioned this morning, was the Killian committee report, which had brought to the fore the need for the medium-range missile, and the fact that it was an easier missile to achieve, perhaps, than ICBM.

The second was the fact that it was originally, I believe—let's put it this way—the impression was originally disseminated that a lesser-range missile would derive from the ICBM if the ICBM were carried to conclusion.

IRBM NOT NATURAL DERIVATIVE OF ICBM

The advisory committee, Technical Advisory Committee, in midsummer, I believe, of 1955, examined into that question and came up with the final conclusion that a lesser-range missile was not a natural derivative of the ICBM, and therefore that a separate program would be necessary were there to be a medium-range missile.

However, during the time from—well, in 1953, I believe the Army first expressed an interest with the rocket engine manufacturers, in engines of larger yield, greater thrust, leading to greater ranges, and the development team had carried forward a considerable number of computations, theoretical experiments in the further area.

But there was no intention of giving great emphasis to that until the Redstone project had been carried to the point where its success was assured.

Mr. HAMILTON. What was the purpose of that project, sir?

General MEDARIS. The Redstone project?

Mr. HAMILTON. Yes; you said until its success was assured. (D)

General MEDARIS. It was laid out to produce a missile of specified weight and range with a high degree of accuracy. (D)

Mr. HAMILTON. And that was the objective of the Redstone project, so to speak?

REDSTONE PROJECT DEVELOPMENTAL RATHER THAN OPERATIONAL

General MEDARIS. That was the Redstone program.

Mr. HAMILTON. From the time it was established until when—the present time?

General MEDARIS. It is still on. It is in the course of being brought to completion at the present time.

Mr. HAMILTON. So the purpose of the Redstone project was never to develop a long-range missile?

General MEDARIS. Was not to develop a long-range missile, the Redstone project as such. However, in the approach to the development of ballistic missiles, that is in the Army's psychology, shall we say, you walk a little bit before you try to run, and there had been no highly accurate, highly reliable ballistic missile of that weight and range carrying capability, or close to it, and it was considered to be a fundamental foundation for extension of the art.

Now, as part of our development approach in all of these fields, we bring along at the same time that our team develops the initial missiles, we bring along a complex of contractors, train and educate them in the art, and phase them in in such a way that by the time a missile is brought to complete development, there will be a capability for production.

At the same time, that also means that at an advanced state of development, a considerable portion of the engineering work connected with bringing the missile to an operational condition can be phased over to the contractors.

That stage was reached in along about mid-1955, also with the Redstone, which meant that the creative genius of our sciences had been behind it at that time, with the proven results to date of the Redstone, the knowledge that it was going to work out, because it had gone far enough in flight tests to indicate that, and the time to take up the next step.

So the more intense interest of the Army, not its interest but rather its ability to participate, came to fruition at that time, and the Army then made its proposal for a medium-range missile.

1955 TURNING POINT IN MISSILE PROGRAM

Mr. HAMILTON. Do I understand you correctly that that was because the Army then felt it was in a position where it could do so, or was it because it felt that it needed such a missile to protect armies in the field?

General MEDARIS. Both.

Mr. HAMILTON. Both?

General MEDARIS. Yes, sir.

Mr. HAMILTON. And you had not reached that position before?

General MEDARIS. No, sir.

Mr. HAMILTON. Before 1955.

General MEDARIS. We weren't in a position to tackle an additional project before that time, not a project of that magnitude, although underlying studies and engineering and theoretical investigation had been going forward on it.

Mr. HAMILTON. I think that is all I have of General Medaris.

Senator SYMINGTON. Senator Jackson.

Senator JACKSON. Might I just follow up where counsel left off on a point. The concepts of atomic warfare were just coming in at this time; isn't that very important?

General MEDARIS. That's right.

Senator JACKSON. In other words, the battlefield was getting bigger and you were completing your analyses of the new tactics that you had to employ in atomic warfare; isn't that a significant part of your

decision in stating a requirement for a 1,500-mile ballistic missile? Isn't that really almost the crux of it?

General MEDARIS. Perhaps you can take care of that, General Gavin.

MODERN WARFARE SUGGESTS NEW ARMY WEAPONS

General GAVIN. I was G–3 at the time there was first expressed a requirement for this missile. Now, General Medaris was not in a position to know that, but as the one responsible for planning the operation and organization of the Army, a memorandum was submitted requesting initiation of the project with Department of Defense.

Senator JACKSON. But I was trying to tie these two in together. I mean, the genesis of this concept that you have discussed here today, and the development of the things that you need as you conceive the size of the atomic battlefield to be, had a very important part in the making of your decision.

General GAVIN. Absolutely.

Senator JACKSON. I was just trying to point out that that decision came recently as weapons have become available to the ground forces for tactical employment.

General GAVIN. Yes, sir.

ARMY APPROACH VERSUS AIR FORCE APPROACH

Senator JACKSON. Then as far as ballistic missiles are concerned, the only service that has been active in the ballistic missile field—I don't mean to get into a service problem, but just for the record—the Army has been following the ballistic field since von Braun came over here; is that right; and the Redstone is a continuation of that approach?

General MEDARIS. The Corporal was the first ballistic missile.

Senator JACKSON. I mean, after V–2, then Corporal, then Redstone.

General MEDARIS. Then Redstone; that's correct. (D)

General GAVIN. We have tended to hold on to just a missile and put different propulsion systems behind it, from the very beginning, and as we try to resolve the differences of our colleagues in the other services, it rather appears in the case of the Air Force they tend to unman the aircraft and bring the wing back to obtain greater speeds in an unmanned vehicle.

We are no doubt approaching the area of collision now. We are getting into a meeting ground where we are overlapping in performance. We have stayed with the missile, and we will put a ballistic missile into business very soon.

Senator JACKSON. The main point I want to get at—if I don't understand this, you correct me—was my understanding that the basis of your requirements stemmed from the new concepts that you had worked out in atomic warfare, and that is really the reason why it came late?

In other words, you talked about a 1,500-mile missile a long time ago, but with atomic warfare becoming a reality, the tactics that you are going to employ changed substantially; I mean, those means by which you are going to carry out your new tactics changed substantially.

This is particularly true in the last couple of years, when the Army has really been able to be in a position to make those prospective changes?

General GAVIN. That's right, sir.

Senator JACKSON. I think that is all, Mr. Chairman.

Senator SYMINGTON. Senator Duff.

PROGRESS, RECENT AND STIMULATED

Senator DUFF. General, all this remarkable progress has been made, then, since March a year ago?

General MEDARIS. It is hard ever to state it that way, Senator, because unless there is a certain amount of advance thinking and engineering work being done and theoretical calculations, and unless you are working ahead in the scientific field of the point which you have obtained in the engineering field, you would obviously sometime run into a complete stop and have to start over again.

So, while so far as hardware is concerned, this progress has all been attained actually since November 8; technically, however, it is the logical fruit of a consistent extension of knowledge and pushing back of the frontiers of capability and proving them out over a period of quite a number of years now.

So you can't consider it just a brandnew thing coming full flower out at that time, because one leads logically into the other.

Senator DUFF. Yes, sir; I understand that phase of it.

Senator JACKSON. Senator Duff, would you yield right at that point?

Senator DUFF. Sure.

Senator JACKSON. I don't want to interject myself into this discussion, but I think this matter really got a little impetus after some of us sent a letter to the President last June, suggesting that an overriding priority be given the ballistic missile, and that was the time the first decision was made on the ICBM, I think, in August, giving it an overriding priority, following then with the IRBM, the joint project No. 2 or 1—1 and 2.

General MEDARIS. Nos. 1 and 2.

Senator JACKSON. But it was at that time that the decision was made to give your program on the ICBM an overriding priority that supersedes all requirements within the executive branch of the Government, as I understand it.

I think that is more or less the historical record. If I am wrong, why let the record show.

Senator DUFF. In any event, whatever the preliminaries were it is very heartening to know that the situation is as has been developed.

General MEDARIS. Thank you, sir.

Senator JACKSON. Senator Duff, I hope that you will be able to get down to Redstone. They have a very interesting project down there.

Senator DUFF. Yes; I want to.

Senator SYMINGTON. Any further questions, Senator Duff?

Senator DUFF. No, sir, no more.

REDSTONE FIRINGS

Senator SYMINGTON. General Medaris, what is the longest missile that you have fired down at Huntsville, in range? (D)

Senator SYMINGTON. And was that of the Redstone type?

General MEDARIS. Yes, sir.

Senator SYMINGTON. Was it a Redstone?

General MEDARIS. It was a Redstone missile.

Senator SYMINGTON. Where did you fire it?

General MEDARIS. At Patrick, at the Air Force missile center, Patrick Air Force Base.

Senator SYMINGTON. When was that?

General MEDARIS. That was the last one we fired. It was the first one we had stretched out a little bit, and we fired it.

General GAVIN. May 19.

Senator SYMINGTON. What was the range of the one that you fired before that?

General MEDARIS. We had fired all previous missiles for predeterminate impact areas. They had not been fired to reach any range, as range would be calculated. (D)

RANGE OF SOVIET MISSILES

Senator SYMINGTON. And how long ago did the Russians fire a missile of around 800 miles?

General MEDARIS. I can't answer that question.

Senator SYMINGTON. You don't know that?

General MEDARIS. No, sir; I do not.

Senator SYMINGTON. Isn't that information supplied you by National Intelligence?

General MEDARIS. We are supplied the technical information in raw form. Our translation of it is largely from a technical standpoint and I might qualify my statement that I can't answer it by saying that I do not feel that the certainty of our deductions is sufficiently correct that I should translate a guess into a flat statement.

Senator SYMINGTON. Would that mean that you doubt that the Russians have fired, say, a rocket of over 500 miles, in your own personal opinion?

General MEDARIS. It does not mean that I necessarily doubt it, sir, but it means that I certainly am not personally in possession nor have I seen any information which would make it unquestionable that such were the case.

Senator SYMINGTON. Have you seen all the information that national intelligence gathers in the missile field?

General MEDARIS. I believe so, sir. Of course, I have no means of knowing whether I have seen it all.

Senator SYMINGTON. Based on that information, how far do you think the Russians have fired a rocket or a missile?

General MEDARIS. Sir, that is not quite fair. That is coming around to say the same thing another way.

Senator SYMINGTON. Would you like to say, for example, that you believe that your range, based on your knowledge of National Intelligence, is greater than any distance that the Russians have fired? (D)

General MEDARIS. Oh, no, sir; I do not think so.

Senator SYMINGTON. Do you know about the development of the V–2 in Germany?

General MEDARIS. Something, I believe.

Senator SYMINGTON. And what was the testimony you gave, the Army gave with respect to the range of the V–2 in World War II?

General MEDARIS. The V–2 had at one time demonstrated, I believe, a range of slightly over 200 miles.

Senator SYMINGTON. Wouldn't it be logical, inasmuch as most of the production sites and many of the scientists the Germans had were taken into Russia, wouldn't it be logical for them to have used extended the range of what they have been firing over what they fired 11 years ago?

NAZI V–2 CONSIDERED RELATIVELY INEFFECTIVE

General MEDARIS. Not necessarily. It would depend on whether they were willing to follow a different type of approach and continue the rather shotgun approach to range that was involved in the V–2.

Again we are dealing with a relationship between payload and range, and I have no hesitancy in repeating what I have said on several occasions: That there is no problem in shooting something for almost any distance. The question is how much can you get there and can you hit what you shoot at.

Senator SYMINGTON. Would you say that because of the lack of accuracy the V–2 was a relatively unimportant weapon in World War II?

General MEDARIS. I would say, for that and a number of different reasons that it was a relatively ineffective weapon, and certainly the V–2, in my personal judgment, represented a technological casualty which I might define by saying that the cost and manpower, money, materials, and national effort to produce the V–2s, was greater than the cost of repairing the damage they caused.

"CRUSADE IN EUROPE" RATED NAZI V–2 HIGHER

Senator SYMINGTON. Have you ever read a book called Crusade in Europe?

General MEDARIS. Yes, sir.

Senator SYMINGTON. Do you remember General Eisenhower saying in that book that if the V–2 had been in the hands of the Nazis and launched against England 6 months before the Normandy landings, those landings would have been "difficult, if not impossible?"

General MEDARIS. I remember that quotation, sir.

Senator SYMINGTON. Then you don't agree with that?

(Discussion off the record.)

Senator SYMINGTON. Let me rephrase my question. I have never discussed the missile picture with you before; right?

General MEDARIS. No, sir.

SOVIETS EXCEED UNITED STATES IN BALLISTIC MISSILE RANGE

Senator SYMINGTON. I have with Dr. von Braun. We would like to have him as a witness.

But what I am getting at is based upon testimony given by us, by this administration, the Communists are well ahead of us in the range they have launched rockets, if not missiles.

My questioning was in an effort to bring out the importance of something you thought was very important; namely, accuracy——

General MEDARIS. Correct, sir.

Senator SYMINGTON. The testimony we have had from people in the Government, outside of the Department of Defense and in the Department of Defense both, is at variance with your testimony this afternoon.

If the Soviets have gone as far as this administration has told Congress they have, it is important for the people to know it. I think you will also agree that it is a great surprise that we haven't yet fired a ballistic missile in this country very far. (D)

Mr. HAMILTON. Senator, for the sake of the record, at least it is not my impression that what the general said was necessarily at variance. He did not intend his testimony to be at variance with the testimony we got from Mr. Dulles.

Senator SYMINGTON. I think the record will show that the general said he has not seen anything which made him feel he could say a missile had been fired seven or eight hundred miles by the Communists; isn't that correct?

General MEDARIS. I believe, sir, that I added the words "with absolute certainty." I have seen plenty to indicate that that probably has happened.

Senator SYMINGTON. I don't want to get into semantics, but if you tell me your range, though I haven't been down there and seen it, I will say that is good enough for me. I will accept that "with absolute certainty." (D)

PRESS INTEREST IN MISSILES

We have this problem. General Gavin was in here at a press conference. I believe it fair to say 90 percent of the questions had to do with missiles; isn't that correct?

General GAVIN. I would say that is correct.

Senator SYMINGTON. We have to get this cleared up on some basis. But I don't want to take the committee's time to pursue this matter further.

General MEDARIS. Might I have the opportunity of just a couple of remarks, then, on the question of range, Mr. Chairman?

Senator SYMINGTON. I would be glad to have you do so.

General MEDARIS. Because the question of distance with missiles, as we have known them and have been able to fire them since 1953, is purely a question of whether you want to do that alone or not.

DISTANCE RELATIVELY EASY TO OBTAIN, IF DESIRED

With no difficulty other than the time required in fabricating the pieces, a missile can be, an object can be, fired well over 3,000 miles. We will do that shortly ourselves. And by no great stretch, 5,000 miles could be achieved. But if the question of firing it to a specific range is taken as the only objective of the exercise, only then is what I say correct, because if the requirement is added that it carry load and

if the requirement is added on top of that that we be able to control it, then that is not true.

Now the question of range that a missile has been fired to can be deduced from its position in space and its velocity measured or estimated at that point, because if it is traveling in a definite direction at a certain speed, it will, by all the laws, go a certain distance, and you can compute its distance within a very small area.

What you cannot discover from that type of computation is how big the part will be that will complete that distance and how much of what is traveling at that point is still booster or added power.

And what you cannot discover further is whether there is anything there but a can to hold a motor and its fuel. But I repeat that the physical problem of throwing an object to a distance well in excess of 3,000 miles is limited only by the time and money that you want to spend to put the parts together. There is no scientific or technical problem involved in it that is not thoroughly known today and has been known for quite some time by our own people. We have considered, and for our own part rejected, as a misapplication of funds, rigging up what Dr. Von Braun's people in their current slang call a "quick and dirty" which could very well be fired well over the 1,500-mile range, but which would accomplish nothing toward achieving an operational missile, because it could not carry a load of any consequence that would be worth what it would cost to launch it, and still to have an operational missile we would have to go back and start over and bring up the hardware.

Those are the facts with respect to range. And that is why, and I am sure you have found that apparent, that is why, as much as I can, I duck the issue of range. I stay out of it because I know there are many, many ways by which you can demonstrate, if you want to demonstrate, fool, if you want to fool, and still have nothing in the way of operational capability.

And since as an Army officer I translate these things only in terms of weapon capabilities, that is why I am not certain of what can be factually derived from the data I have seen.

Does that help any to make my feeling clear?

Senator SYMINGTON. Well, I am very interested in your position and have listened to it with care.

RANGE ONLY ONE FACTOR, BUT IMPORTANT

Range is only a part of the problem. But it is one of the major parts of the problem. The V–2 was considered a terribly lethal weapon not only by the Commander of our Expeditionary Forces, General Eisenhower, but also by many people I talked with including Air Chief Marshal Porter and Air Chief Marshal Tedder. They were forced to receive it. Many people felt it might have changed the course of the war if they had had it some months sooner than they did.

Now they also took back to Russia a great deal of the operational capacity and engineering talent incident to the building of the V–2. There are many people in this Government who have taken a great interest in the missile picture in recent years. That is all to the good.

SERIOUS TO DISCOUNT SOVIET CAPABILITIES

But what I don't like to see done is discount the fact that 14 years ago the Nazis fired a missile; 11 years ago they built it and used it in operational quantities; and since then the possible enemy, who is really the only reason we are sitting around this table, have been concentrating very hard on it.

PLACING ACCURACY AND RANGE IN PERSPECTIVE

Now I agree accuracy is very, very important, but accuracy would seem relatively less important because of the hydrogen bang as against what it was when the bang was TNT; although relatively more important because of the additional ranges now desired.

UNITED STATES RANGE SHORT

But without any criticism of any service, and I have had experience in at least two services, extensive experience in the armament picture, what is hard for me to understand is why even as of today we have never fired a missile in any service in this country, a supersonic missile, very far.

RECENT INTEREST IN MISSILES

I don't think you can write down range any more than you can write down accuracy, or you can write down reentry problems, or guidance problems. To me it would seem they all tie together.

INFORMATION INDICATES SOVIETS AHEAD

What I was trying to bring out in questioning you was the fact that, based on national intelligence furnished this committee, and based on what I knew before from the National Security Council, I believe the Soviet is well ahead of us in this field.

I don't say by any means that they are well ahead of us in all missiles. I do believe they are well ahead of us in some, including the surface-to-surface one that you are building. I think it is very important we give you the fullest support to try and make up ground lost to them, because of the relative disinterest we had until recently in certain aspects of the missile field.

Those were the thoughts in my mind. I now yield to Senator Jackson.

Senator JACKSON. I think maybe I could help by a couple of questions to clarify some points.

As I understand it, General, it is your judgment that if you want a missile that has accuracy and a payload capability, the smart thing from a technological standpoint, the smart scientific approach, is to obtain all the information you can get before you start firing long range: but if a country has fired a lot of missiles over a long range, it is reasonable to assume, assuming that they have good scientists, it may be reasonable to assume that they have developed quite a long range missile.

In other words, they just wouldn't be firing stuff helter-skelter, would they?

General MEDARIS. I shouldn't think so.

Senator JACKSON. If they are good scientists I think that answers it. If there had just been one firing and that is all, that would be something else again, but if there has been a lot, and assuming they have a good scientific work group, it would be reasonable to assume they are pretty well along in the missile field.

Senator SYMINGTON. Time between firings becomes rather important too as they develop their position.

Senator JACKSON. Assuming their approach is the same as ours, I mean if they are making these firings of some range, quite a number of them, it would mean that they are pretty well along; wouldn't that be reasonable to assume?

General MEDARIS. If they were following the same pattern of development that we are.

Senator JACKSON. Yes, assuming they were.

General MEDARIS. Yes, assuming they were following the same development pattern that we do.

NUCLEAR INFLUENCE ON MISSILE PRACTICALITY

Senator SYMINGTON. The ballistic missile was in effect dropped around 1949 because of two things: the requirement of accuracy and the weight of the warhead.

Both of those changed so completely as the result of the development of the hydrogen bomb, plus tremendous improvement in the weight of the warhead, that people who though the ICBM was too theoretical completely revised their opinions after they were shown what could be done.

Mr. Counsel?

Mr. HAMILTON. I have nothing.

Senator SYMINGTON. Senator Duff?

Senator DUFF. The only thing I have to say is I think the general has made very clear what his beliefs, opinions, and experiences are.

Senator JACKSON. I want to compliment the general on a fine presentation.

Senator SYMINGTON. General, we will go to the first briefing, and I can't remember which one it was.

General MEDARIS. Might I be excused then, sir?

Senator SYMINGTON. Yes, indeed. General Gavin, who was the first one; you yourself?

General GAVIN. Yes, sir; I was the first one.

Senator SYMINGTON. Mr. Counsel, will you proceed with your questions?

Mr. HAMILTON. Yes. General, would it be agreeable with you if, in the course of my questioning, I directed all of the questions to you, and then if you cared to refer one or the other of them to one of your colleagues, you could do so?

General GAVIN. I would appreciate that very much. That will work fine.

Mr. HAMILTON. Then we won't have to call each of these gentlemen up separately.

With reference to a preliminary question, and in connection with the general considerations you discussed in the paper that you read

as your opening, is it the Army's view that in the event of a large war, the first phase of it would be an airpower battle?

General GAVIN. I am not sure that I know what you mean by "a large war."

Mr. HAMILTON. Assuming we were attacked by the Russians. The committee has been told there is general agreement among the services that the first phase, the initial phase of the war, would be a struggle for air supremacy.

General GAVIN. You have already described the war in saying that the Russians would attack the United States.

Mr. HAMILTON. Yes.

BELIEVES PERIPHERAL WAR MORE PROBABLE THAN GENERAL WAR

General GAVIN. I would say that the Army believes now that we are far more likely to be involved in a peripheral war than we are in a general war.

DOES NOT BELIEVE FIRST PHASE TO BE PRIMARILY AIR BATTLE

Mr. HAMILTON. Yes, I understand that, but I mean assuming there were a general war, would you agree with the view that has been expressed that the first phase of that war would be a struggle for air supremacy?

General GAVIN. No; I would not, personally.

Mr. HAMILTON. What would be your view as to the initial stage of a war, of a general war of that kind?

General GAVIN. In giving my views, I would have to express some understanding of the intent of the Russians, and I believe their intent, if it were to ultimately venture the risk of a large war in order to achieve an objective, they would start on the basis of a limited objective to put themselves in a better position, and perhaps ultimately cause enough deterioration of our position to where they could win without risking any attack upon the U. S. S. R. (D)

ANTIAIRCRAFT EFFECTIVENESS IN KOREA

Mr. HAMILTON. Another question or two with regard to your paper. You mentioned the increased percentage of aircraft that were shot down in Korea by antiaircraft activity.

General GAVIN. Yes, sir; of all losses, percentage of all losses.

Mr. HAMILTON. Percentage of total losses. To what extent would that extrapolation, which was indicated on the curve that you had on the chart, show a different result in the Korean war with respect to the use of aircraft as compared with the situation in World War II? I have in mind such things as the altitude of the aircraft.

General GAVIN. Well, from the viewpoint of the Army, we would not consider the Korean war an isolation. It is part of the overall pattern of the effectiveness of fire.

There were a number of things that occurred in World War II that were not quite understood, and as we came to the end of that war we had the strategic-bombing survey team visit both the far-eastern area and the European area, and although we had expeced to have inflicted very devastating damage upon, let us say, Germany, although we had

increased our bomb tonnage from July 1, 1942, to the end of 1944 by 5,000 percent, the fact is the German industrial production increased in a pattern paralleling the increase in bomb-tonnage delivery.

Now, this was a phenomenon that few of us understood, and I personally studied the strategic-bombing survey report with care and interest.

Between World War II and Korea we watched the improvement in performance of aircraft of our colleagues in the Air Force, and we looked to them for considerable support, and we got very fine support from them, I might say, I believe, as well as they physically could give.

AIRPOWER LESS EFFECTIVE THAN EXPECTED IN KOREA

There were those in some quarters who felt at the outset of the Korean hostilities that the relative ineffectiveness of the enemy land forces against air would result in them being badly defeated before land forces intervened at all.

Nevertheless, when we did go in and all the shooting was over and we had some 143,000 casualties in the land forces, and we did all that we could, Operation Strangle, and the like, to cut off and destroy the North Korean-Chinese Communist forces, when we got through they were better prepared, apparently, to continue operations than they had been at any time.

Now, I am not saying this in criticism of the United Nations Air Forces at all. I am concerned solely with the improving effectiveness of land forces.

The one aspect of the Korean air situation that impacted on us at once was that we did not strike the source of air strength of either side. This may have changed the balance in casualties.

Maybe we would have had different losses if we had penetrated deeply into Manchuria and they in turn had somehow managed to get air over Pusan and perhaps as far as Japan, but the fact is they both concentrated against the land forces in the main, and the air forces giving close support to land forces, and when we got all through our losses were quite high, and they were still quite able to carry on.

LAND CONTROL THE DECISIVE FACTOR

We are now into a family of very effective surface-to-air missiles, Nike I, Nike B, and the only point I endeavor to make from that chart was that as we analyze the overall trend now, we see emerging a pattern that suggests clearly the control of land areas will be decisive.

Again the point I wanted to make was the trend toward the significant improvement in effectiveness in surface-to-air fires, and then in turn extrapolate that into the conclusion that the control of land areas will be decisive.

Precisely again in the Korean area I am not sure what difference it made. I really don't know.

EVALUATION OF BATTLE STATISTICS

Mr. HAMILTON. The chart rather gave the impression, whether it was intentional or not, that the effectiveness of surface-to-air weapons

against aircraft had proven to be preponderantly greater in the Korean war than it had been in World War II.

General GAVIN. Yes, that is true.

Mr. HAMILTON. And that is the impression I think the chart conveyed.

My question was really addressed to such points as these: To what extent did the fact, as I understood we were told, that aircraft made attacks in the Korean war at lower levels, and such additional factors as there being no attacks made at night on bombers by opposing fighter aircraft—to what extent would that mitigate against the impression that the chart gave?

General GAVIN. I am really not sure. I think that this is true, that the performance of aircraft had reached the point where air-to-air kills were less likely than in World War II, and since that percentage fell off, the percentage of surface-to-air kills proportionately went up of the total.

And this I point out as a weakness really in my figure. But I don't know really anything more precise that I could say about it.

OPTIMISM ABOUT FUTURE MISSILES

Mr. HAMILTON. I think it was in connection with the presentation about Jupiter that there was considerable confidence expressed that you would be able to develop a countermissile missile, so to speak. First I wonder if you could amplify somewhat the considerations that are the source of that confidence.

General GAVIN. Well, I can and I will ask the officer who briefed on that, Colonel Sigley, to talk on it if need be also.

We have been working with this problem now for from 2½ to 3 years. I have personally visited several of the facilities where this work is being done, and I have spent many hours discussing the possibilities of dealing with the missile.

It is a very impressive problem. It will be very difficult. Perhaps we are optimistic. There are scientists who tell us that we are to a degree.

But we have talked to the people who must make that hardware. We have talked to people who are authorities in this field, and we rather believe, we do believe our figures can be met, our estimates of when we can come up with an antimissile missile.

Mr. HAMILTON. You have the same degree of confidence in having adequate facilities for the detection and identification and the transmission of that information to the missile launching site.

General GAVIN. I should say, too, that perhaps in the antimissile missile field we have the most venturesome estimate of all, of all the presentations you have heard here today—— (D)

Mr. HAMILTON. Am I right in the impression that was expressed with considerable confidence?

General GAVIN. That is right; yes, sir. (D)

Mr. HAMILTON. Is that a matter within your jurisdiction?

General GAVIN. Yes, it is.

Mr. HAMILTON. That is to say, Army research and development field?

General GAVIN. Yes; it is.

AIR FORCE ALSO INTERESTED

Mr. HAMILTON. How does that relate to work that the other services would be doing in the same field?

General GAVIN. Well, the Army, in carrying out its role in air defense, has been into this for some time. I believe I am correct in saying that about a year ago our colleagues in the Air Force went to a number of contractors who have been working for us for some time. I know they did to Bell Labs, to Sylvania, and they too are generally working with the same contractors.

I do not think that there is duplication, but a great deal of scientific thought comes from common sources, let us say.

AIR FORCE RESPONSIBILE FOR CONTINENTAL DEFENSE

Mr. HAMILTON. What is your understanding of the role of the Army in the air defense of the continental United States?

General GAVIN. The Army is to contribute weapons for the anti-aircraft defense of the United States. This as far as the Army is concerned does not specify the type of the threat. We just must defend the country from air attack by providing surface-to-air weapon fire.

Mr. HAMILTON. And how does that stand in relation to any responsibility that the Department of the Air Force has in that?

General GAVIN. The Air Force provides the aircraft for interception, and they are now manning the distant mid-line and the early warning systems, and they have been given as executive agent the responsibility for the continental air defense.

Mr. HAMILTON. That was the thing that rather puzzled me. I had understood they had responsibility for the command of the continental air defense; is that correct?

General GAVIN. As I understand it, the Air Force has been designated as the agency responsible for the continental air defense.

ARMY RESPONSIBILE FOR SUPPLYING ANTIAIRCRAFT WEAPONS

Mr. HAMILTON. Then what is the Army's role?

General GAVIN. The Army is one component contributor.

Mr. HAMILTON. Then in the research and development field, am I right in my impression that it is your view the Army has responsibility for the development of ground-to-air weapons?

General GAVIN. This is correct; yes, sir.

NIKE VERSUS TALOS

Mr. HAMILTON. What then, under that concept of the different functions, would be the relationship between Nike and Talos?

General GAVIN. Well, the Army is responsible for providing the surface-to-air weapons, and it has provided Nike, and it is carrying out the development of Nike B. (D)

Mr. HAMILTON. But the Air Force has its Talos.

General GAVIN. Well, the last authoritative information I have on the relationship between the Air Force and Talos is the Talos has been given to the Air Force to use as a training vehicle pending development of Bomarc. This I believe I can say to be a fact.

Mr. HAMILTON. Pending the development of Bomarc?

General GAVIN. Pending the development of Bomarc.

Mr. HAMILTON. You say the Army is conducting research and development with respect to the development of the detection and identification devices for long-range missiles?

R. AND D. IN DETECTION AND IDENTIFICATION SYSTEMS

General GAVIN. Yes; it is.

Mr. HAMILTON. Once that is developed, how would it be utilized? Would it be utilized as part of the early warning lines? Assuming that you make a development that is useful in that regard, how would it be deployed in connection with our continental defense?

General GAVIN. We have two problems now. The Army is responsible for the continental defense, the contribution of antiaircraft weapons to it, and also the defense of vital overseas installations and field armies. (D)

A great deal of thought has been given to it, and it appears as though they (different systems, Ed.) will not be incompatible. But until we are really sure where we are going in those, I don't believe we can say just how they will fit in.

To be more accurate about this, I would like to ask Colonel Sigley if he wants to say anything further on it. He may have a chart on it, as a matter of fact.

Colonel SIGLEY. I think I can clarify this by means of a chart, sir.

OPTIMISM, JUSTIFIED OR MISLEADING

Senator SYMINGTON. Let me choose my words carefully on this. Up until this briefing in the main all briefings that we have had on air defense have said that to date there was no defense against an ICBM ballistic missile even in theory.

Now this is the first chance that I have ever had in any detail to see a briefing which involved something in theory anyway that might be a defense against it. What worries me is that one time you will remember we had a meeting about some of the statements made by some of the German scientists, I think you were there and General Ridgway was there.

General GAVIN. I was there.

Senator SYMINGTON. And I protested it because I thought it was too optimistic. And therefore I am very interested in this theoretical approach to the ICBM.

If this is too optimistic then it is misleading. If it is justifiable then it is not misleading, and that is why it is mighty important.

I would say there is nothing more important to our defense, especially in the future.

General GAVIN. Well, from the viewpoint of the Army it is gratifying to find this interest in the work we have done in this area.

Senator SYMINGTON. Anybody who would not be interested in that would be pretty silly from the standpoint of our defense; wouldn't you say?

Senator JACKSON. There is no question we have the responsibility; and the scientists I have talked to over a period of time say this is the only known approach, at least that makes any sense at this time.

I assume that is what you are talking about, missiles against missiles. (D)

General GAVIN. We would have prepared a more comprehensive briefing and with additional charts if I had known of your interest.

I would go so far as to suggest if you are interested that we bring in some of the scientists who support us to discuss this in complete detail.

We have done a great deal of work on it.

Senator SYMINGTON. We would be very glad to. I think it is an incentive if we recognize the possible enemy has gone a long way. It stimulates our interest in what we should do, as quickly as possible.

I did not mean to say that accuracy is not tremendously important. I was trying to say that range also was important.

General GAVIN. Yes.

RANGE FOR ATTACK; ACCURACY FOR DEFENSE

Senator SYMINGTON. We are in a discussion which has everything to do with range from the standpoint of the attack, and everything to do with accuracy from the standpoint of defense. Is that a fair statement, as we look at this?

General GAVIN. I would think so; yes, sir.

Senator SYMINGTON. This is interesting. Before the hearings are over we ought to have more detail as to the possibilities of this type and character of interception; don't you agree, Senator?

Senator JACKSON. Surely.

General GAVIN. We would welcome the opportunity to give you details.

Senator SYMINGTON. Let me yield to Senator Jackson, and if he has nothing, then to counsel.

Senator JACKSON. I just had 2 or 3 questions; not on this.

Mr. HAMILTON. I have 1 or 2 more on this.

COST OF PHASE OF DEFENSE SYSTEM

Do you have any notion as to what it would cost to install a system of this kind, General?

General GAVIN. I think we have estimates on it.

Colonel SIGLEY. There are no cost estimates, sir, on the production but on the R. and D. cost to develop this system we estimate between $150 million and $200 million. (D)

Senator JACKSON. Mr. Chairman, I have one question in this area. Isn't there a serious time gap here, if the Soviets now or even soon were to have the capability of launching ballistic missiles at our mainland from submarines? (D)

NO DEFENSE NOW AGAINST MISSILES FROM SUBMARINES

General GAVIN. If they have this capability to which you refer, in the next few years, it will be a very serious threat. We do not now have the capability to defend against such missiles. (D)

Mr. HAMILTON. What is your opinion as to the effect of the improved surface-to-air missiles upon the role of the interceptor manned aircraft in defense against manned aircraft?

General GAVIN. Well, the Nike B will be performing in much better fashion in most respects than any manned interceptor can.

Mr. HAMILTON. What about its accuracy?

General GAVIN. Well, of course, there is just no comparison in my personal opinion. A manned interceptor cannot compare with the Nike B.

Mr. HAMILTON. You think that the Nike B would make the manned interceptor to some extent obsolete?

General GAVIN. I would certainly say so. Of course it cannot, like the manned interceptor, fly around and be launched from someplace else later.

Those are two different things, but just on straight interception from a launching point the missile is far superior.

Mr. HAMILTON. What about the possibility of jamming it?

General GAVIN. We have done a great deal of work in this area with our friends in the Air Force at Fort Bliss.

We are working on it all the time. We recognize the real serious threat we have here, and it is a very serious one. Basically it would appear as though anything that a man can put in an airplane and fly around he can do better on the ground with it, that is if countermeasures are used, we should be able to devise counter-countermeasures.

So far it has been a nonending seesaw in our experience with the Air Force at Fort Bliss.

I think it is a very serious threat to our system, but we hope by just working at the problem and working with the Air Force on it we can stay ahead. (D)

Senator SYMINGTON. In World War II we put a thousand B–17's over Berlin. How many B–29's did we put over Tokyo?

General MUSGRAVE. We had about a thousand in 1 day.

Senator SYMINGTON. We know the Russians are building great numbers of airplanes. There is not anybody who denies that any more. If they made an attack on a city, they would do their best to stay dispersed and yet at the same time have as many planes on the target as possible. What assurance do we have that the city could be defended by the missiles you talk about? What is the problem from the standpoint of mass attack? (D)

EVEN FUTURE DEFENSES VULNERABLE

Colonel COVERT. Of course, one plane getting through would be enough to destroy a city. If he chooses to put a big enough attack against any one of the defenses, even the defenses we contemplate getting eventually, he can hit that city. (D)

Senator SYMINGTON. General, it is now a quarter of 5 and we can't finish. I have some more questions here, the counsel has some more questions. I am sure Senator Saltonstall will have some. He will be here.

Can you go with us tomorrow?

General GAVIN. Surely; yes, sir.

Senator SYMINGTON. Would 10 o'clock be all right?

General GAVIN. Ten o'clock is fine, sir.

Senator SYMINGTON. Senator Jackson, how does that sound to you?

Is there anything you would like to ask tonight? (D)

Senator JACKSON. That concludes my questions.

Senator SYMINGTON. General, then we will look forward to seeing you tomorrow at 10.

Thank you very much.

(Whereupon, at 4:50 p. m., the committee was adjourned to reconvene at 10 a. m., Wednesday, May 23, 1956.)

STUDY OF AIRPOWER

WEDNESDAY, MAY 23, 1956

UNITED STATES SENATE,
SUBCOMMITTEE ON THE AIR FORCE OF THE
COMMITTEE ON ARMED SERVICES,
Washington, D. C.

The subcommittee (consisting of Senators Symington, Jackson, Ervin, Saltonstall, and Duff) met, pursuant to recess, at 10:05 a. m., in room 212, Senate Office Building, Senator Stuart Symington (chairman of the subcommittee) presiding.

Present: Senators Symington, Saltonstall, and Duff.

Also present: Fowler Hamilton, general counsel; Ramsay D. Potts, Jr., associate general counsel; Fred B. Rhodes, legal consultant to Senator Saltonstall; Edward C. Welsh, assistant to Senator Symington; and Ronald Friedenberg and Wallace L. Engle, staff members.

Lt. Gen. James M. Gavin; Brig. Gen. John P. Daley; Lt. Col. Donald S. Bussey, Plans Directorate, ODCSOPS, DA; Brig. Gen. David W. Gray, Director of Operations, ODCSOPS, Department of the Army; Brig. Gen. R. D. Meyer, Chief, Requirements Division, Office Deputy Chief of Staff, Logistics, United States Army; Maj. Gen. Russel L. Vittrup, Assistant Deputy Chief of Staff for Military Operations, Department of the Army; Lt. Col. Woodrow B. Sigley, Office, Chief, Research and Development, Department of the Army; Col. John C. Dalrymple, Office, Chief, Research and Development, Department of the Army; Lt. Col. John R. M. Covert, Office, Chief of Research and Development, Department of the Army; Lt. Col. W. J. Lynch, Plans Division, Office Deputy Chief of Staff for Logistics, Department of the Army; Lt. Col. Francis J. Kelly; Col. Arthur C. Small; Lt. Col. Vallard C. Smith, Missile and Air Defense Division, Office, Chief of Research and Development, Department of the Army; Lt. Col. Allan S. Hirsch, ODCSOPS, Department of the Army; Lt. Col. Elmer P. Curtis, Office, Chief of Research and Development, Department of the Army.

Adm. J. E. Clark, Director, Guided Missiles, Office of Chief of Naval Operations; Capt. S. S. Searcy, Jr., Office of Chief of Naval Operations, United States Navy; Lt. Comdr. C. C. Buck, Office of Guided Missiles, Chief of Naval Operations.

Mr. Clarke A. Morgan, OSD, Security Office; Mr. Bernard S. Bodganowicz, OSD, Security Office.

Senator SYMINGTON. Gentlemen, we will call the hearing to order.

TESTIMONY OF LT. GEN. JAMES M. GAVIN, CHIEF OF RESEARCH AND DEVELOPMENT, DEPARTMENT OF THE ARMY; ACCOMPANIED BY BRIG. GEN. JOHN P. DALEY, DIRECTOR OF SPECIAL WEAPONS, OFFICE, CHIEF OF R. & D., DEPARTMENT OF THE ARMY; BRIG. GEN. DAVID W. GRAY, DIRECTOR OF OPERATIONS, ODCSOPS, DEPARTMENT OF THE ARMY; BRIG. GEN. RICHARD D. MEYERS, CHIEF, REQUIREMENTS DIVISION, OFFICE, DEPUTY CHIEF OF STAFF, LOGISTICS, UNITED STATES ARMY; COL. JOHN C. DALRYMPLE, PLANS BRANCH, PLANS AND PROGRAM DIVISION, OFFICE, CHIEF OF RESEARCH AND DEVELOPMENT, DEPARTMENT OF THE ARMY; AND COL. ARTHUR C. SMALL, CHIEF, FINANCIAL MANAGEMENT BRANCH, PLANS AND PROGRAM DIVISION, OFFICE, CHIEF OF R. & D., DEPARTMENT OF THE ARMY—Resumed

Senator SYMINGTON. General Gavin, will you consider yourself sworn?

General GAVIN. Yes; I have been.

Senator SYMINGTON. And if any additional person in your group testifies, will you notify the Chair if he has not been sworn, so that he can be sworn?

General GAVIN. I will; yes, sir.

Senator SYMINGTON. I do not quite remember where we left off yesterday, but I believe that counsel was asking questions. Senator Duff, if it meets with your approval, we will proceed.

Senator DUFF. Very well.

Senator SYMINGTON. Mr. Reporter, in hearings of the Government Operations Committee, the record shows what Senators were present at the various stages of the testimony, when they come in and when they leave.

Because of the nature of some of this testimony, I believe if we could do that, it would be well.

(REPORTER'S NOTE.—Senators Symington, Saltonstall, and Duff were present at the commencement of the hearing, and remained throughout the morning session.)

Senator SYMINGTON. Will you proceed?

Mr. HAMILTON. I wonder if you could briefly state for the record, General, the purposes for which the Army has and is seeking to obtain additional missiles.

MISSILES RELATED TO ARMY MISSION

General GAVIN. Well, the Army is developing its present family of missiles in order to carry out its primary function, the conduct of sustained combat on land, which requires considerable depth and great dispersion.

The need for long-range supporting fire becomes more evident.

Now, it is somewhat a matter of scientific coincidence that the state of the art allows the development of missiles at the same time that we have come upon a nuclear weapon.

Mr. HAMILTON. I am sorry—what was that again?

General GAVIN. I say, it is somewhat a matter of scientific coincidence that the state of the art allowed the development of missiles within the same time frame that developed nuclear weapons. They are complementary, in fact.

R. AND D. GUIDELINES FOR THE ARMY

Mr. HAMILTON. Now, turning to the organization of your research and development in the Army, does the Army operate under guidelines as to its budget in research and development?

General GAVIN. Yes; it does.

Mr. HAMILTON. I wonder if you could describe briefly the way in which the guidelines operate.

General GAVIN. Yes.

I am currently working on the 1958 budget——

Mr. HAMILTON. Yes.

General GAVIN. About 2 months ago, I—perhaps less than that, about half a month ago is closer—I was given general guidelines on which to draft my budget for 1958. This I understood to be just an initial cut, shall I say, something on which you base your planning for the fiscal year 1958.

Mr. HAMILTON. Yes.

General GAVIN. In order to take care of any changes that might take place, I was authorized to submit, in addition to the monetary figure I was given to work in, I was authorized to submit a 10 percent additional list and a 15 percent additional list.

ARMY R. AND D. BUDGETS

Now, within that framework, my 1958 budget has now been prepared.

Mr. HAMILTON. Has been prepared?

General GAVIN. Yes, sir.

Mr. HAMILTON. I wonder, General, and not to take the time of the members of the committee by going into great detail, but would you be so kind as to submit for the record a summary, submit in summary form, at least, in research and development, the expenditures by the Army, say, over the last 3 years, broken down by fields of research; or at least broken down, let us say, between missiles, on the one hand, and other projects, on the other; and then, with respect to missiles, if you could, break down expenditures for Nike and Jupiter—I believe they were the two principal ones.

General GAVIN. Yes; I can. I have my fiscal man here, and to be sure that you are getting the very accurate figure that you want, I would like to have him give that to you.

Mr. HAMILTON. Could you do that now?

General GAVIN. Yes; all right. This is Colonel Small.

Mr. HAMILTON. How do you do. You have been sworn, haven't you?

Colonel SMALL. Yes, sir.

Senator SYMINGTON. Counsel, would you yield at that point?

Mr. HAMILTON. Yes.

Senator SYMINGTON. General Gavin, the other service before us so far was the Air Service. You know that?

General GAVIN. Yes, sir.

Senator SYMINGTON. The Air Force showed figures as to guidelines. They showed they might be allowed to increase authorization and apportionments in two chunks, as I remember it; a 10-percent increase, and then a 15-percent increase.

General GAVIN. Yes, sir; for 1958.

Senator SYMINGTON. Could we have your testimony as much as possible in the same pattern as theirs, so we could analyze them together.

General GAVIN. Yes.

CHANGE IN BOOKKEEPING PROCEDURE

Senator SYMINGTON. Apparently, there was some major change in accounting procedure at a point about 2 or 3 years ago which, unless you analyzed that change, made it appear as if the service in question was getting more for research and development as against the previous year.

If I remember correctly—and I have not reviewed the previous testimony—each year for a 3-year period, the Air Force was allotted a figure of $431 million; but, based on the way the budget appeared in print, on at least one occasion that $431 million figure appeared as $610 million, because of this change in accounting procedure, but not because of any actual increases in the budget.

I present this to you—and am glad Admiral Clark is here, so he too will see the pattern that has been developed with the Air Force—in the hope the same pattern in presentation can be given by the Army and by the Navy. In that way—we will have all ducks to compare, instead of comparing ducks with chickens.

Senator SALTONSTALL. Mr. Chairman, it is my understanding and my memory—I won't say exactly—that the bookkeeping would be a little difficult or maybe misleading, because the Army's and Navy's bookkeeping are different from the Air Force bookkeeping.

I notice that the Navy has been more advanced in launching the new form of bookkeeping and that the Army is next and that the Air Force is the furthest behind.

I put that in because I am not sure that the figures could be comparable, for that reason.

Senator SYMINGTON. We discussed that the other day. You and I participated in a colloquy with the Air Force on it. I don't know whether you are right or not.

Senator SALTONSTALL. I don't either.

Senator SYMINGTON. Certainly we want to do what is right.

My point in bringing this up is in an effort to have all figures on the same comparable basis——

Senator SALTONSTALL. Yes.

Senator SYMINGTON (continuing). To the greatest extent possible; so when we analyze we will know we are dealing with the same type and character of procedure.

Mr. HAMILTON. I wonder if it would save time if these gentlemen from the Army, who have copies of the other transcript, would have a look at it, and later supply a statement; that is, supply a statement

now, and if they care to supplement it, they can, because it is complicated.

Senator SYMINGTON. If the information is available this morning; do you care to proceed now, or do you want to hold it for the record?

General GAVIN. Yes, sir; I was about to suggest, in order, really, to provide clear, useful information, we will later give you a table in the same format as the other presentation, insofar as we can.

However, now we are quite prepared to answer questions, and hope to hit the very point you want.

Mr. HAMILTON. All right, with emphasis on the missiles.

General GAVIN. Yes.

I presume that this problem of an apparent increase in funding refers to the absorption of maintenance and operations in R. and D.

Mr. HAMILTON. Yes, sir.

Senator SYMINGTON. Will you proceed as you see fit.

General GAVIN. All right, sir; fine.

Senator SALTONSTALL. Mr. Chairman, before you do that, just let me ask this:

General Gavin, are you now going to submit for the record some comparable figures later, or are you submitting your figures now?

General GAVIN. I am stating for the record now the research and development figures that I have been given for the past several years.

Senator SYMINGTON. If the Senator will yield——

Senator SALTONSTALL. Yes.

Senator SYMINGTON. As I understand it, you are going to submit figures at this time reserving the right to submit any additional information later on you think is pertinent for the record, after you and your people have scrutinized the previous testimony?

General GAVIN. Yes, sir; that is it.

I am not sure what I am giving now is in a form comparable to the figures of the Air Force, and that is what I asked, to check.

Senator SALTONSTALL. What I would like to assure is that you are going to submit figures later, and I would like to have the opportunity to see them before they go into the record, and have the opportunity, possibly, to question you on them, as to how they are comparable.

General GAVIN. Yes, sir.

Senator SYMINGTON. If at any time you care to recall the witness, the committee will be very glad to do that.

Senator SALTONSTALL. Well, that is all I intended.

Senator SYMINGTON. Will you proceed?

IMPORTANCE OF EXPENDITURES

Colonel SMALL. There are several considerations involved here, and the first one is the expenditures of the Army throughout the years. The basic question I have is, Do you mean obligations or actual expenditures?

Mr. HAMILTON. Actual expenditures, if you have them.

Senator SYMINGTON. You have authorization, appropriation, apportionment, obligation, and expenditure. But nothing really means anything, I am sure you will agree, except expenditures.

Colonel SMALL. That is correct.

Senator SYMINGTON. Thank you.

FUNDS FOR OTHER AGENCIES INCLUDED

Colonel SMALL. By way of explanation before I submit these figures on expenditures, there were included in the Army budget for the past 6 years certain DOD joint agencies, the Armed Forces special weapons project, and the National Security Agency—these are the DOD agencies—which are not controlled by the Chief of Research and Development of the Army for program purposes.

However, they are included in our budget, and I have eliminated the expenditures relating to those agencies from the total amount.

Senator SYMINGTON. What agencies?

Colonel SMALL. The DOD agencies: Special Weapons and National Security Agency.

Senator SYMINGTON. And they have money in them?

Colonel SMALL. Yes, sir.

Senator SYMINGTON. How was that money obtained, under what appropriation?

Colonel SMALL. Army Research and Development appropriation.

Senator SYMINGTON. So that they took part of that money in reserve; is that correct?

Colonel SMALL. No, sir.

We are told each year how much to submit in the formal budget to the Congress for those agencies, and we add them to the Army program.

Senator SYMINGTON. Is that segregated?

Colonel SMALL. The first time it was segregated was in fiscal year 1954. We show that as segregated in our formal budget.

Senator SYMINGTON. And in previous years you have submitted that as part of your budget, but actually they have not been part of your budget?

Colonel SMALL. Yes, sir.

Senator SYMINGTON. Or only part of your budget if the Department of Defense decided it be a part of your budget.

Colonel SMALL. For administrative purposes only, they are included in the Army appropriation.

Senator SYMINGTON. What percentage, roughly?

Colonel SMALL. About 10 percent.

Senator SYMINGTON. The two of them would be about 10 percent?

General GAVIN. I think that is very close.

Colonel SMALL. Between 7 and 10 percent.

Senator SYMINGTON. All right.

Colonel SMALL. About that magnitude. We carry the two DOD agencies in our budget.

Senator SYMINGTON. You mean percentage, or dollars, or both?

Colonel SMALL. Dollars and percentage, both.

Senator SYMINGTON. Is there any reason you know of why the amount you carry should be more than the other services?

Colonel SMALL. No, sir; there is no reason I know of, other than traditionally the Army has been requested to put it in its appropriation.

Senator SYMINGTON. Well, when you have the budget explained to you, as far as decision is concerned and administration by the Comptroller of the Department of Defense and/or his Office, don't you

go into discussions of that character, or is it simply: "Here it is; take it as it is?"

General GAVIN. I would like to answer that.

Senator SYMINGTON. Yes.

General GAVIN. I have had to defend—let us use that expression—my 1957 budget before the Department of Defense, and when you are given these things to carry, I assume that it is an administrative facility, that is, it saves the DOD the time of doing a great deal of budget preparation, setting up a budget of their own, and they realize what we are doing, and we have been told to do it, and I see no reason to question it, and I have not, so far.

Senator SYMINGTON. This money, it never comes back to the Army?

General GAVIN. That is correct.

Senator SYMINGTON. When we had Air Force testimony, and I am a little hazy here, it was they would apportion it back—but if I get your operation, this has nothing to do with reapportionment back to the Army?

General GAVIN. Oh, no, not at all.

Senator SYMINGTON. My final question, and I am sorry to labor it, but I want to understand.

When the budget is presented to the Congress, is it a fact that these are not funds for the Army but are funds which the Department of Defense is presenting at the same time?

General GAVIN. I believe so; is that correct, General Daley?

General DALEY. Yes, sir. I feel that the Department of Defense has told us to carry this. It has nothing to do, really, with our research and development programs. It is an administrative device to put this into the budget, and it is recognized by the Congress, I believe, that these are separate funds that have to be carried some place, and they are carried in the Army budget and, as far as I can believe, accepted as not part of the Army research and development.

Senator SYMINGTON. Thank you. There were some funds in the Air Force picture which would at least come back in part to the Air Force. I believe, therefore, this is a different item.

General GAVIN. I think it is.

Senator SALTONSTALL. Well, Mr. Chairman, I would prefer to make this first off the record and then if you want to put it on the record, it is all right.

(Discussion off the record.)

Senator SYMINGTON. Back on the record.

General GAVIN. Shall we go ahead.

Senator SYMINGTON. Yes.

EXPENDITURES FOR ARMY RESEARCH AND DEVELOPMENT—1941 TO 1956

Colonel SMALL. I have the budget exclusive of the DOD agencies that I have mentioned from 1942 to 1956, estimated in the last year. Do you want those recited?

Senator SYMINGTON. Mr. Counsel?

Mr. HAMILTON. Yes. Just read those figures into the record.

Colonel SMALL. 1941, $19 million; 1942, $69 million; 1943, $149 million; 1944, $139 million; 1945, $177 million; 1946, $114 million; 1947, $88 million; 1948, $113 million; 1949, $124 million; 1950, $109

million; 1951, $143 million; 1952, $252 million; 1953, $340 million; 1954, $353 million; 1955, $335 million; 1956, estimated, $370 million.

Senator SYMINGTON. What were those figures, again?

Colonel SMALL. Expenditures for Army research and development.

Senator SYMINGTON. Thank you.

Did they include your expenditures on missiles?

Colonel SMALL. Yes, sir.

EXPENDITURES FOR MISSILES

Senator SYMINGTON. Can you segregate your expenditures on missiles from those figures?

Colonel SMALL. I cannot do that today.

Senator SYMINGTON. Will you do that, and supply it for the record?

Colonel SMALL. Yes, sir.

Senator SYMINGTON. If, because of accounting procedure, it is not possible, please say so.

(The requested information has been supplied to the committee in classified form.)

Mr. HAMILTON. In that regard, could you also segregate out of the general category of missiles, the expenditures on the Nike and the expenditures on the Jupiter, and if there are other expenditures with respect to missiles that come from other funds, such as procurement, construction, or others, would you indicate that in your statement?

Colonel SMALL. Yes, sir.

OTHER COST ITEMS INCLUDED IN RESEARCH AND DEVELOPMENT FIGURES

The second item you asked for was the additional amount included in the research and development appropriations from other appropriations, which inflate the amount of the research and development appropriations without increasing, necessarily, the level of effort of research and development.

In fiscal year 1956, we picked up $26 million of maintenance and operations-type costs of Army facilities.

Mr. HAMILTON. They were included in the figures you gave us for 1956 earlier? Was this $26 million included in the total you gave for research and development?

Colonel SMALL. Yes, sir; it would have been—for expenditures?

Mr. HAMILTON. Yes.

Colonel SMALL. But for obligational purposes we picked up $26 million worth of maintenance and operations type costs and added it to the Army research and development appropriations total.

Mr. HAMILTON. So, to get your expenditures for research and development alone, should the $26 million be subtracted from the figure?

General GAVIN. That is correct.

Colonel SMALL. To give comparable—that is correct, because these are obligations that become immediately liquidated in the administration of our research and development facilities. In addition, in fiscal year 1957, we increased that amount by another $26 million.

Senator SALTONSTALL. What do you mean, increased——

Colonel SMALL. The increased requirements——

Senator SALTONSTALL. $52 million?

General GAVIN. Yes, sir, $52 million was the total.

Colonel SMALL. This is work that does not go on to direct research and development, that is right.

Mr. HAMILTON. Well, does a similar situation exist, that you know of, with respect to the 1958 budget?

Colonel SMALL. It would depend upon instructions from the Department of Defense. We know of none now at the present time of additional costs we will need to pick up in the research and development appropriations.

General GAVIN. We anticipate the same condition to prevail in 1958, that we will carry the Maintenance and Operations in research and development facilities.

Senator SYMINGTON. Did you give us the figure for 1957?

Colonel SMALL. Additional, $26 million.

General GAVIN. A total of $52 million.

Mr. HAMILTON. Am I correct in the impression that that is the total for the 2 years?

General GAVIN. No, sir——

Senator SYMINGTON. We are talking about the planned expenditures, 1957?

General GAVIN. The $52 million additional picked up that year—now, there is within the remaining figure, Maintenance and Operations carried also.

Senator SYMINGTON. General, you read off a figure from $109 million in 1950 to $370 million in 1956. What is the planned figure comparable to $370 million for 1957?

General GAVIN. Well, we don't have it yet. Actually, we have an execution budget planned.

Senator SYMINGTON. But you have an estimate in 1956 of $370 million; so what is estimated in 1957?

Colonel SMALL. It should go up to about $390 million.

Senator SYMINGTON. That is the figure we wanted. Thank you.

Mr. HAMILTON. Will $52 million be subtracted or not?

Colonel SMALL. No, it will be included in our expenditures for research and development. If you want to strike it out, I can——

Mr. HAMILTON. No; I just want to be sure. We want the record to show whatever the facts may be.

All right, sir, do you have anything further on that point?

General GAVIN. No, except to say once again, sir, we will check the format of the presentation you want and give to the committee the figures in the form you would like them.

RESEARCH AND DEVELOPMENT COOPERATION BETWEEN THE SERVICES

Senator SYMINGTON. General, if you have concluded on that point, could you describe briefly the extent to which there is cooperation between the Army, Navy, and Air Force in research and development, with respect, for example, to the development of the IRBM Jupiter-type missile?

General GAVIN. Yes, sir, I can; and I will be very glad to. In addition, I have here my senior officer in charge of development of missiles, General Daley, who can fill in any details which I may lack.

But, broadly, we have in existence a joint committee headed by, chairmanned by, Secretary of the Navy Thomas; Secretary Brucker is on that, and Assistant Secretary of the Navy Smith, and the Director of Research and Development of the Army, Mr. Martin.

In addition to that, the senior military officers concerned with research and development of both services are on that committee.

Now, they meet periodically and consider the programing that has been going on, about once a month they have a meeting, and monthly they consider the program.

The Army has established an Army Ballistic Missile Agency under General Medaris at Redstone Arsenal, and also there are Navy officers working with the Army Ballistic Missile Agency who assure their requirements for a ship-based missile being met.

The Navy has, in addition, an agency of their own here in Washington and I will ask General Daley later to describe that.

We have a number of liaison officers out at various facilities from the Army Ballistic Missile Agency. General Medaris prepares a monthly report showing the progress to date, the problem areas, and the funding, expenditures to date, and funding requirements of the future.

This is submitted in written form and in addition one of his staff comes to Washington to brief the joint committee monthly, at which time these problems are discussed at that level.

The report of the joint committee is then submitted to the Department of Defense. I should point out that the Department of Defense has a committee working with Dr. Von Neumann, or he has been for some time, until he recently was taken ill—and that committee meets periodically about once a month to look into our program and they call for presentations from the services, from both services—all services, as a matter of fact, the Air Force and the Navy as well as the Army, on technical problems that apparently need resolution.

They consider our report and in turn make recommendations to the Department of Defense to which we must respond. They pertain, usually, to technical matters, as to how we should go about our guidance systems, propulsion systems, and so on.

That in general rather outlines it. I think General Daley might be able to fill in details.

Mr. HAMILTON. Well, I think that is adequate, unless he cares to supplement it.

General DALEY. I might supplement it simply by the remark that the executive committee of the Joint Army and Navy consists of General Daley and Admiral Clark.

Mr. HAMILTON. Thank you. That is fine.

ARMY TARGETS

Turning now to the question of these targets. (D)

General GAVIN. Yes, sir.

Mr. HAMILTON. I wonder if you, or one of your colleagues, would describe how those targets were determined. (D)

General GAVIN. Yes.

I will ask Colonel Dalrymple to respond.

Colonel DALRYMPLE. This target study was developed in the Department of the Army by one of the agencies in the Department and from the chart, if you recall, we showed the areas of contact. (D)

Within those areas detailed studies were made of fixed targets and of what we term transitory targets, targets that would be associated with troop dispositions.

Mr. HAMILTON. And you came up with targets that were of particular interest to the Army from the standpoint of Jupiter. (D)

Colonel DALRYMPLE. Yes. (D)

Mr. HAMILTON. And when you referred to a war, I take it you were referring to an all-out war, as distinguished from a peripheral war?

Colonel DALRYMPLE. Yes, sir; adjusted not just to the European theater, and on that basis we arrived at targets which would be assigned to a missile having the characteristics of Jupiter. (D)

APPROVAL OF TARGETS SYSTEM BY JCS

Mr. HAMILTON. And what is the relationship, if any, between the targets that you have just been discussing and the assignment of targets by the Joint Chiefs of Staff? (D)

Colonel DALRYMPLE. I am not quite sure I understand that, sir.

Mr. HAMILTON. Do you know whether or not the Joint Chiefs of Staff have made any assignment?

General GAVIN. I perhaps had better get into this for a moment.

The Joint Chiefs of Staff, as such, have not assigned targets to any one service. They have required for SAC to submit their plans for review and analysis and the JCS analyzes those plans, capability planning, projected in the future—now, that normally will consist of a target annex—

Mr. HAMILTON. Of what?

General GAVIN. Target annex. One annex to the plan would be the targeting system.

Mr. HAMILTON. You say the Joint Chiefs of Staff, so far as you know, have not made up any list of targets?

General GAVIN. No, that is correct, that is right.

Senator SYMINGTON. Could I interrupt, Mr. Counsel?

Mr. HAMILTON. Well, that concludes my questions on that point.

Senator SYMINGTON. I would like to ask you this: We were shown the possible targets on the Eurasian land mass in case we were attacked.

General GAVIN. Yes, sir.

Senator SYMINGTON. What were the targets for the Air Force and what were targets for the Navy, and what were targets for both.

General GAVIN. Yes, sir.

Senator SYMINGTON. SAC reports to the Joint Chiefs of Staff, not to the Chief of Staff of the Air Force; therefore, the implication given the committee was that there is a target system approved by the Joint Chiefs of Staff. Am I correct in that analysis?

General GAVIN. That is one way to express it, sir.

ROLE OF SAC RE TARGETS

The Joint Chiefs of Staff have approved of SAC's plan and SAC has been directed and other overseas commands have been directed to coordinate their plans with them, and this consisted of a meeting in Omaha of representatives from overseas on at least one occasion and, in addition, SAC people have visited overseas to make sure that there

was a dovetailing of plans to make sure they don't overlook some targets——

Senator SYMINGTON. Let me restate the question.

Is it not true that the target proposal has been approved by the Joint Chiefs of Staff?

General GAVIN. The Joint Chiefs of Staff, I know, have approved of the SAC plans. I don't believe the Joint Chiefs of Staff have gone into a detailed analysis of each target. (D)

Mr. HAMILTON. That concludes my questioning.

Senator SYMINGTON. Senator Saltonstall?

Senator SALTONSTALL. Well, I would just like to ask General Gavin this:

You mentioned these various expenditures from the Research and Development funds. It is my memory that there is the overall figure of $5,200 million for all 3 services for research and development.

How much of that does the Army get? Have you included that at all? In other words, out of your procurement and out of the various other funds?

PROCUREMENT EXPENDITURES

General GAVIN. Oh, yes, sir. Now, procurement is another field and if you would like our P. and P. figures, I can give them to you.

Senator SYMINGTON. I think that would be very instructive Senator. Excuse me for interrupting. We would be very glad to have those figures in the record, if you would like them.

Senator SALTONSTALL. Well, I would be interested, if we can have them.

General GAVIN. Yes, sir. I have our Deputy Chief of Logistics, General Meyer.

General MEYER. I would like to speak in order of magnitude, Senator, because it is very difficult to get an expenditure figure for long-range procurement, inasmuch as obligations this year are generally not expenditures for a year or more later.

As in order of magnitude, the Army, over the last fiscal years, 1955, 1956, and 1957, has been devoting about $500 million of procurement funds for the procurement of items which have not yet completed development.

That is to say, not only prototypes, out of design, but the earlier, or early production models of such things as Nike I, Nike B—for example, and other items, where we begin production and, therefore, the figure which I gave takes account of the procurement and production obligation for all of those items in which research and development is not completed, and this figure is in the order or magnitude of $500 million. (D)

Senator SALTONSTALL. That is 1955?

General MEYER. 1955, and planned for 1957.

Senator SALTONSTALL. It is about the same amount?

General MEYER. That is right.

Senator SALTONSTALL. Is there any other account, General Gavin, that you get funds from to contribute to research and development? You get funds from what you call procurement and production—are there any others?

General GAVIN. No; none that I know of, sir. Colonel Small would like to comment.

OTHER BUDGET ACCOUNTS

Colonel SMALL. The Department of Defense, in their testimony, furnished figures showing the total amount you are talking about.

It is also our understanding that included in that total figure they put an estimate for military personnel in research and development activities and military construction—it is just my understanding—for military construction, and the estimate for the Army on that for the 3 years, 1955, 1956, and 1957, was $1.9 million, for 1955——

Senator SALTONSTALL. 1.9 what?

General GAVIN. Million.

Senator SALTONSTALL. Million?

General GAVIN. Yes; $8 million in 1956 and, planned for 1957, $43 million.

Senator SYMINGTON. Do you mean that the Army's appropriations for construction were only $1.9 million?

Colonel SMALL. For research and development facilities.

Senator SYMINGTON. For research and development facilities?

Colonel SMALL. Only.

The military personnel estimated, that is based on average cost; for military personnel, $35 million in 1955; $40 million in 1956; $46 million in 1957.

Now, these are the figures that the Army submitted to the Department of Defense in answering a question from them. Whether they took our figures and amended them or changed them for their computations, I don't know.

Senator SALTONSTALL. Then, taking the comparable year 1956—you did not give us all the figures for 1957—you would have $370 million in your research expenditures, out of which you contributed $26 million to what you call DOD; is that correct? And then you received, in addition, $500 million from P. and P; $43 million from the construction account, and $40 million from personnel; so that you would add those figures and subtract $26 million to get the actual amount the Army had for overall research and development?

General GAVIN. This is fiscal year 1956?

Senator SALTONSTALL. Yes; because you did not give the figures for 1957.

General GAVIN. I think the figure is $8 million for construction.

Senator SALTONSTALL. No; I had in 1956, $500 million, P. and P.; $43 million, construction; $370 million, research; $40 million, personnel—out of which you deduct $26 million.

General GAVIN. It is $8 million, I believe.

Colonel SMALL. $8 million for construction in 1956.

Senator SALTONSTALL. Yes; I had that in 1955—well, then, scratch out all of that and let us get it right.

What are the figures for 1957? Put it that way.

Colonel SMALL. $43 million for research and development, military construction.

Senator SALTONSTALL. Yes.

Colonel SMALL. $46 million for military personnel. Procurement, $500 million——

General MEYER. May I qualify that further, Mr. Chairman? This half billion figure which I quoted represented the obligation for all

items in which research and development has not been fully completed. In other words, it does not represent an item which has gone through what we call type classification.

That gives you a figure comparable to the figure which I believe was presented by the Department of Defense. If one restricts the amount of money obligated out of procurement and production appropriations for items which truly support only research and development, that is to say, a prototype model, the figure is closer to $200 million.

Senator SALTONSTALL. Well, then, do I understand correctly—I have a straight research and development expenditure of $390 million; your construction was $43 million overall; the overall P. and P. was $500 million; your personnel was $46 million, and deducted from that was $52 million as a contribution to DOD——

General GAVIN. Except that the first figure is $380 million, sir; other than that, the figures we agree with.

Senator SALTONSTALL. $380 million?

General GAVIN. Yes.

Senator SYMINGTON. This is fiscal year 1957.

Colonel SMALL. I think we are getting confused on the contribution from the Department of Defense. That is included in our total expenditures, the $390 million.

Senator SALTONSTALL. I see.

Colonel SMALL. And they are part of the Army research and development costs.

Senator SALTONSTALL. Yes. And it is deductible, I see.

ARMY'S RESEARCH AND DEVELOPMENT FUNDS OF $380 MILLION

General GAVIN. However, the figure is $380 million, not $390 million.

Senator SALTONSTALL. I had it down as $390 million. Well, then when you talk of the $5,200 million, which is Mr. McNeil's figure, from the Department of Defense, that would be the Army's share?

Colonel SMALL. Approximately.

Senator SALTONSTALL. I don't think I have any further questions.

Senator SYMINGTON. Senator Duff?

VALUE OF GUIDELINES

Senator DUFF. One thing I would like to get cleared up in my own mind. I am wondering what implications are to be imputed to the guidelines that are constantly brought up. Now, it seems to me, and I would like to have your comment on this observation—I assume that the purpose of the guidelines is to impose certain ceilings, and the question is not whether the guidelines are improper but whether or not they unduly restrict your activities within the particular range in which they are made; is that correct?

General GAVIN. My personal impression of this, and I have been in research and development about 6 months, is that the guidelines are a help, they give me something to plan on, and I can begin to make a budget in them, and get my administrative work behind me. I would say that they are an administrative facility.

Senator DUFF. That is what I wanted to get clear, because there could be the implication that it was putting an unreasonable ceiling

on you that would prevent a free expression of your demands, since those guidelines have been established.

In other words, you feel they are helpful?

General GAVIN. Well, yes, sir. As I say, I hope I did not overlook a question in your statement—No; we must have something in the form of guidelines, otherwise you cannot get on with the program.

Senator DUFF. The only reason I asked, Mr. Chairman, was that I had a feeling that there was an atmosphere that, since there were guidelines, that that was it, and they were restricted unnecessarily by those guidelines, and therefore I wanted to ask that question.

That is all at the moment, sir.

FIVE AND TWO-TENTHS BILLION DOLLARS: A COMPOSITE FIGURE

Senator SYMINGTON. General, about this $5,200 million. What is that figure?

General MEYER. I am not familiar with that, sir.

Senator SYMINGTON. Senator Saltonstall, you mentioned a figure of $5,200 million. What was that figure?

Senator SALTONSTALL. $5,200 million is my understanding of the total expenditure for the Army, Navy, and Air Force, overall, for research and development, including the amounts that are in these various other accounts, outside of the straight research and development, and that figure was submitted to the Appropriations Committee by Mr. McNeil and one other gentleman, I don't remember his name; and that, as I understand it, is the total amount in this 1957 budget.

Senator SYMINGTON. Well, now, of that $5,200 million——

Senator SALTONSTALL. Mr. Chairman, as I figured it out, and I just asked, and the colonel, I think, substantiates it, the Army's share of the $5.2 billion for 1957 would be $927 million total after deducting the $52 million that General Gavin said went to DOD.

Senator SYMINGTON. Now, let us proceed with that figure—$900 million including maintenance and operations; construction and procurement. As I understand it, the figure for research and development for the Army for the fiscal year 1957 is estimated as $390 million, less $52 million, or $338 million; is that correct?

General GAVIN. That is correct.

Senator SYMINGTON. And the figure for 1956 out of that $5,200 million, eliminating all those additions, is $370 million, less $26 million, or $344 million; is that correct?

General GAVIN. Sir, if——

Senator SYMINGTON. That is, the estimated figure for 1956.

General GAVIN. This $5,200 million figure, as I understand the source of it—it is a new figure to me, but this, I understand, is fiscal year 1957——

1956 ARMY RESEARCH AND DEVELOPMENT BUDGET, $344 MILLION

Senator SYMINGTON. Let me pursue this again. Let us talk about fiscal year 1956. As I get it from the testimony, $370 million is the estimate for 1956?

General GAVIN. That is correct.

Senator SYMINGTON. Less $26 million for maintenance and operations.

General GAVIN. Correct.

Senator SYMINGTON. Or a total of $344 million for research and development.

General GAVIN. That is right.

Senator SYMINGTON. Is that correct?

General GAVIN. That is correct.

1957 ARMY RESEARCH AND DEVELOPMENT BUDGET, $338 MILLION

Senator SYMINGTON. The estimate for 1957 is $390 million, less $52 million for maintenance and operations, or a total of $338 million; is that correct?

General GAVIN. That is the comparable figure.

Senator SYMINGTON. In other words, regardless of all the bookkeeping and accounting, the facts are that on research and development in the year 1957, estimated, the Army will have some $6 million less for research and development than estimated in 1956; is that correct?

General GAVIN. That is correct.

Senator SYMINGTON. Thank you. Now, let us talk a bit about guidelines.

Senator SALTONSTALL. Well, Mr. Chairman——

Senator SYMINGTON. Would the Senator want me to yield?

Senator SALTONSTALL. Yes; I ask you to yield.

Senator SYMINGTON. I would be glad to.

QUESTION OF WHAT IS AND WHAT IS NOT RESEARCH AND DEVELOPMENT

Senator SALTONSTALL. Let us make this clear, then. As I understand it, General, and see if you agree with me: Into research and development goes the prototype of these various missiles and the various tanks and the various other equipment on which you are working and which you are trying to improve, and until they go into the production line for use in the forces, they are in the development stage, which is a part of the research stage?

General GAVIN. Yes, sir.

Senator SALTONSTALL. So that, with strictly the research, or the basic research, if you want to call it that, you have these other elements which you have to include properly to say the overall research and development of Army equipment?

General GAVIN. P. and P. funds contribute directly to the furtherance of the research and development program.

Senator SALTONSTALL. That is what I had in mind.

Senator SYMINGTON. You can include it but it is not expense for research and development. It is expense for procurement, maintenance and operations, and construction. It is misleading to the American people to have a figure of $5,200 million given out for research and development when the actual figure is but a small fraction of that. I heard about a statement made yesterday to the effect it might be dangerous for the next man to raise his head. I am not commenting on that kind of talk, but I trust everybody in this hearing realizes they are under oath to give their honest opinion. The Congress, which under our Constitution puts the money up, has a right to those opinions.

Senator SALTONSTALL. Well, I would respectfully disagree with the Senator on that—but I won't argue on that now, except to say that, regarding this thing in Florida that goes into the ocean someplace, certainly all of the expenses that go into that and all of the weapons that go out, while they are still being researched and developed, are not in production; that is what I mean.

Senator SYMINGTON. Does the Senator disagree with my statements that these officers should give their opinion?

Senator SALTONSTALL. Not a bit, but——

Senator SYMINGTON. Or disagree with the opinion that construction for maintenance and operations is not true research and development?

Senator SALTONSTALL. No, I would not agree with you on that.

Senator SYMINGTON. That is——

Senator SALTONSTALL. I would not agree; that is why I interrupted.

Senator SYMINGTON. So, the Senator thinks that the building of a building for research and development is research and development?

Senator SALTONSTALL. Yes, because otherwise your research and development could not be carried forward; you cannot do it in the open air.

Senator SYMINGTON. And that the procurement of prototypes and production is part of research and development?

Senator SALTONSTALL. Yes; that is where you and I differ.

Senator SYMINGTON. Yes. All I am trying to do is to find out how much money we are spending for actual research and development. Off the record.

(Discussion off the record.)

Senator SYMINGTON. On the record.

General, I would like to discuss this guideline situation a bit.

Let me ask you this:

PREFERENCE AS TO GUIDELINES PROCEDURE

Would you rather get together the figures which show what, in your opinion, as the head of research and development for the Army, you think are the right figures for research and development; or would you rather be told that figure by the Department of Defense, with the understanding that that was the figure you should request?

General GAVIN. I would much prefer to get together the figure of my requirements as I understand them.

Senator SYMINGTON. Well, you said—and I am only trying to get the facts for the record—you felt the guidelines were helpful. I can see how guidelines might be helpful from the standpoint of your understanding how much money you were going to be allowed.

But would you not prefer to present what you might call Army guidelines to the Department of Defense, as to what was needed, regardless of money; and then have the Department of Defense tell you how much, because of the importance of money, you could have?

General GAVIN. Yes; I would much prefer that course, in submitting my requirements.

Senator SYMINGTON. Thank you, General. Have you any questions, Mr. Counsel?

Mr. HAMILTON. No.

Senator SYMINGTON. Senator Saltonstall?

Senator SALTONSTALL. No more.
Senator SYMINGTON. Senator Duff?
Senator DUFF. No more.

ARMY MISSILE TARGET INFORMATION

Senator SYMINGTON. I have a few questions incident to this missile picture. These questions have been furnished me by the committee staff.

My first question: For any of the short-range missiles, do you not have to have prestrike and poststrike information regarding targets?

General GAVIN. Yes; no question about it.

Senator SYMINGTON. Next question: How do you get the target information?

General GAVIN. It depends upon the range of the target and the availability of the information, Mr. Chairman.

We are counting largely upon the known conventional methods of getting information now, and we are also counting on our sister service, the Air Force, which has in the performance of its normal functions provided us with aerial protographic coverage of target areas insofar as possible; by strike information, if any effort was made, and we also now look to the possibilities of using drones and electronic devices beyond anything that we have used in the past.

For example, we feel that the field of infrared as a detection device should get greater attention, and we are putting money into it in our research and development program, and applying that to drones, and we hope to be able to get more information.

We feel likewise that drones with, for example, television-type transmitters will offer information—and as I say, these are the newer approaches, in addition to the well-known things, such as the interrogation of prisoners, the interrogation of dissidents and precombat information, prisoners of war, and the like.

I mention these other sources, drones, because we are not sure of the survival probability of manned aircraft on reconnaissance missions, so we are aggressively pursuing the possibilities of drone reconnaissance now.

Senator SYMINGTON. Yes. Yesterday the Chair tried to get consideration for the growing strength of the Communists, which opinion was based primarily on photographs and extensive hearings we have had with the national intelligence agency, the CIA. That was the reason for some of our questioning.

CORRECTION OF PREVIOUS RECORD

Now, General Gray, in his statement, says on page 2:

> The Nike is the only fully operational surface-to-air missile in the world today.

Would you comment on that statement, General?

General GRAY. I interpolated "free world." It was not changed in the original statement.

Senator SYMINGTON. I see. You would like to leave it that way?

General GRAY. For the record it should be "free world," and those were the words that I used yesterday afternoon.

Senator SYMINGTON. We have received some information about known preparations for the defense of some of the cities in Russia, so "free world" would be right; and it is in effect that way, isn't it, in the reported record?

General GRAY. Yes. That is the way I said it yesterday afternoon, "free world."

STATEMENT NOT INTENDED TO INCLUDE SOVIET OR NAVY MISSILES

General GAVIN. Yes, sir; it should be "free world." Furthermore, I think it should be "land based," because the Navy has some very fine ship-based missiles.

General GRAY. I used the words "land based," too.

Senator SYMINGTON. Well, if the record shows it that way, fine.

General GRAY. Yes, sir.

Senator SYMINGTON. I did not prepare this question. It came from the staff. It is good to know you are not running down the capabilities of the Communists to make a good surface-to-air missile.

General GRAY. We are aware of the defenses around Moscow.

RESPONSIBILITY FOR AIR DEFENSE

Senator SYMINGTON. In your formal statement yesterday, General, page 3—and I ask you this primarily as a result of a colloquy between military people in the recent press conference, you stated the Army has responsibility for air defense by missiles fired from the ground at targets in the air; is that right?

General GRAY. I used the words "has had" responsibility.

Senator SYMINGTON. "Has had" or "does have"?

General GRAY. "Has had" were the words I used; yes, sir.

Senator SYMINGTON. I see. When you say "has had," does that imply a change in the situation; or to the best of your knowledge, is that the way it is now?

General GRAY. That is the situation as it exists now. The Army does have responsibility for providing the antiaircraft forces with, in effect, those that fire missiles from the ground at targets in the air.

Senator SYMINGTON. And does the Air Force have responsibility for providing and equipping units for air defense?

General GRAY. Yes, sir; Air Force forces.

Senator SYMINGTON. Now, in your opinion, frankly, is there duplication in this field?

Senator SALTONSTALL. What was that word? Would you repeat your question?

Senator SYMINGTON. In your opinion, frankly, is there duplication in the field?

Senator SALTONSTALL. Thank you.

QUESTION OF INTERSERVICE DUPLICATION IN MISSILE FIELD

General GRAY. There is no duplication now because the Air Force is providing manned interceptors, in accordance with the Air Force's own theory of providing the missile screen and the first defense against attack on the United States and the Army provides for the antiaircraft forces which work within that screen and defend specific areas.

Senator SYMINGTON. Well, you say the word "now." Do you think there is going to be duplication as the situation is growing and, if so, where?

General GRAY. Well, first, I said "now," because, speaking of the operational forces, there is no duplication. We have our antiaircraft units, and the Air Force has its interceptors.

Now, the Air Force does have under development missiles and that is a question that is being studied in DOD now, so I don't know whether DOD people could answer that——

Senator SYMINGTON. In other words, if the range of the missiles the Army is developing and the range of the missiles the Air Force is developing continue to be extended, you feel there may be a duplication which will have to be adjudicated; is that right?

General GAVIN. I will take that one.

Senator SYMINGTON. I would appreciate that.

General GAVIN. I think a conflict is inevitable in this area.

The Bomarc, which is an unmanned interceptor of considerable promise, will, when it becomes operational, be really in the missile category, and as Nike B extends in range outside an area there will have to be discussion and perhaps revision on areas of possible disagreement.

However, this will be an interim condition. I feel that we are on the threshold, if not already in, the IRBM area, and when we get to that, range is not as important as getting up there, very, very fast.

Now, I am not quite sure what the Air Force plans are to deal with this, but certainly I see, in the immediate future, conflict.

Senator SYMINGTON. I am grateful to you for your frankness, which is typical of you. All we want in this committee is try to find out the facts.

General GAVIN. Yes, sir; I understand that.

KEY WEST AGREEMENT RE MISSIONS

Senator SYMINGTON. When you mention "agreement," would you be referring to something like the Key West agreement?

General GAVIN. No, sir; I was referring to the JCS agreement, which was a working arrangement of the areas of responsibility.

Senator SYMINGTON. But as far as the public knows, the Key West agreement stands today, if you include with it the Newport agreement?

General GAVIN. Yes, sir.

Senator SYMINGTON. And to the best of their knowledge, those are the agreements that now define the roles and missions of the services today; is that correct?

General GAVIN. That is correct.

Senator SYMINGTON. Thank you. I was much impressed yesterday with all the briefing, especially the IRBM briefing.

IMPORTANCE OF INTERMEDIATE RANGE BALLISTIC MISSILE

There has been in some quarters an effort to run down the importance of the IRBM, at least in the hands of the United States.

Do you feel the IRBM is an important weapon for us to have?

General GAVIN. Very important; a very important weapon, indeed.

SIGNIFICANCE OF SOVIET IRBM'S

Senator SYMINGTON. More specifically, in the public press a statement was made that if and when the Rusians got the IRBM it would not result in any change in the balance between the East and the West. What would your thoughts be as to the importance of our getting or the Russians getting the IRBM?

General GAVIN. If the Russians acquired one that was operationally reliable and accurate, significantly ahead of us, it would—it could make a great difference in our power position.

Senator SYMINGTON. When this statement was made, apparently the idea was that it would not make a great difference because the Soviets already have many thousands of their modern IL–28 jet bombers; on the other hand, it would be far easier for our defenses in Europe to shoot down a jet bomber, would it not, with say a surface-to-air missile, or with defense fighters, than it would be to handle the attack of such a missile; is that correct?

General GAVIN. Yes. The answer to that clearly would be "Yes." Yes.

Senator SYMINGTON. Thank you, General.

SOVIET MISSILE FIRINGS

Yesterday, in questioning General Medaris, I was trying to bring out that in at least one of the major component parts of missile development, to the best of our knowledge, the Soviets are ahead of us: Range.

Without getting into how far they can now shoot a missile or how far they may have shot a missile, it is a fact, is it not, that we have received evidence of their shooting a missile or a rocket hundreds of miles operationally?

General GAVIN. Mr. Chairman, we have evidence they have fired an object that must have been a rocket for several hundreds of miles in some numbers.

Senator SYMINGTON. And it is a fact, is it not, that in your opinion this tremendously increases the importance of our raising the range of such missiles as the Redstone, along with improving its operational possibilities?

U. S. SHOULD PUSH IRBM AND ANTIMISSILE MISSILES

General GAVIN. Yes; I would say that is so. More important than that, sir I think we should aggressively push the antimissile missile field now. (D)

From the viewpoint of research and development, we are quite worried about this. It is the most imposing technical problem and while it does not seem a matter of such great public concern as IRBM, I predict it will be very soon.

It is a very important program.

IMPORTANCE OF SOVIETS MISSILE RANGE SUPERIORITY

Senator SYMINGTON. And as you see it, then, if I follow your thinking, inasmuch as the Communists have proved, to the best of

our knowledge, that they are well ahead, if not way ahead of us, in the range of ballistic missiles, this fact tremendously increases the importance on our part of getting some defense against that type of missile as quickly as possible; is that correct?

General GAVIN. To the latter part I would say yes, sir.

Senator SYMINGTON. Read the question back please; if there is any part you don't agree with, I wish you would be frank.

Would you read the question, Mr. Reporter?

(The question was read.)

General GAVIN. Yes; that is correct, sir.

Senator SYMINGTON. Well, I am glad you say that, because to the best of my knowledge they are farthest ahead in any missile up to 1,500 miles by a great deal than any other missile development, ground-to-ground, in the country today.

General GAVIN. We believe that is correct, sir.

Senator SYMINGTON. I believe this is correct, based on testimony from the services. If it is also true that you have not fired a ballistic missile very far, we ought to do everything we can to help you extend the range. We are only talking about range, not about guidance and so on. (D)

General GAVIN. Yes, sir; I realize you are.

Senator SYMINGTON. Thank you.

REFERENCE TO CORRECTION OF THE RECORD

General GRAY. This is what the record says with respect to your testimony yesterday on surface-to-air missiles:

The Army has NIKE, the only fully operational surface-to-air missile in the world today.

That is the way the reporter took it down.

General GAVIN. Mr. Chairman, I would like to say in his behalf that I was listening to this very thing and it is my recollection he did say "free world."

Senator SYMINGTON. I am absolutely sure General Gray said it, if he said he said it.

Mr. HAMILTON. Yes; someone said it; I think the reporter copied the statement.

Senator SYMINGTON. These reporters do a magnificent job. But it is hard for them sometimes to get every word, inasmuch as some of the statements are read very fast. So at times they have to make reference to the document presented to the committee.

General GRAY. I recall that I did say "in the world," and then I caught myself and said "free world."

Senator SYMINGTON. I see. Anyway, we have it cleared up.

This had to do with missiles. There is another subject, with the committee's approval, I hope we can get into. That is the question of airlift.

DANGER OF PERIPHERAL WAR

It has been my opinion for a long time that peripheral wars must be recognized as possibilities by this Government, as well as all-out wars. Airlift would appear of great importance in the handling of any peripheral war.

I think your point was well taken yesterday, something to the effect that if you cannot handle peripheral wars it might mean that you would find yourself in an all-out war.

Would you rephrase that as you put it in your statement yesterday?

General GAVIN. Well, as I recall, it is in the record: Inability to deal with peripheral wars might in itself almost invite and bring on a general war.

Senator SYMINGTON. If you want to change what you just said to conform with what you said yesterday, please do that, for the record.

General GAVIN. Yes, sir.

ARMY AIRLIFT TO BE TAKEN UP LATER

Senator SYMINGTON. For a long time I have felt that the airlift potential of the Army, as organized by and in the Air Force, which by agreement serves the Army in this field, is inadequate. The committee would like to be briefed on the aircraft aspect of the Army, especially with respect to airlift.

General GAVIN. Yes, sir.

Senator SYMINGTON. We are not in a position to discuss that this morning, are we, counsel?

Mr. HAMILTON. We have been confining this briefing to missiles.

FURTHER REFERENCE TO CORRECTION OF THE RECORD

Senator SYMINGTON. General Gray, yesterday the phrase was, reduced to the simplest terms, that under CONAD the Army has the responsibility for air defense. I think you felt this morning you said, "has had." Would you like to correct the record, or keep it as it is?

General GRAY. "Has had" are the words I used.

Senator SYMINGTON. "Has had?"

General GRAY. Yes, sir.

Senator SYMINGTON. You want to change it to "has had"?

General GRAY. "Has had"; yes, sir.

General GAVIN. "Has had."

Mr. HAMILTON. I think that was the testimony, "has had."

Senator SYMINGTON. Without objection, the record will be corrected accordingly.

Senator Saltonstall?

MISSIONS OF THE SERVICES

Senator SALTONSTALL. I would like to ask 2 or 3 questions, based on what you said.

Let me make clear for myself, General Gavin, this problem of missions and agreements and decisions.

Now, the missions of the Army, the Navy, and the Air Force were agreed upon in Key West in 1949; isn't that correct?

General GAVIN. Yes, sir.

Senator SALTONSTALL. And those have been testified to by several ranking generals, including yourself, as the missions today, with perhaps some modifications, but not many?

General GAVIN. That is correct; yes, sir.

Senator SALTONSTALL. Now, is it not true that the mission must be carried out by decisions of the Joint Chiefs of Staff, and those decisions result in agreement as to responsibilities of the services; is that a fair statement?

I will read it again, if you want.

General GAVIN. I would appreciate it.

Senator SALTONSTALL. The missions as set out in Key West must be carried out by the decisions of the Joint Chiefs of Staff, which decisions result in agreement as to the responsibilities of the three services?

General GAVIN. I would change the word "decisions" to "agreements," in the first place, sir, and say that the Joint Chiefs of Staff reach agreement, within which framework the services can carry out their missions.

They further interpret in detail their missions and where there are areas that overlap or conflict, the JCS discuss and reach agreement to bring into working harmony the three services, and the Marine Corps.

Senator SALTONSTALL. And I agree with what you said, that there are certain areas where in the near future, as the result of further development of various types of missiles, those agreements of the JCS will probably have to be modified further.

General GAVIN. That is probably so; seems reasonable.

Senator SALTONSTALL. That would seem reasonable?

General GAVIN. Yes, sir.

Senator SALTONSTALL. Could you clarify for me two phrases you used in answering the Chairman?

SOVIETS WELL AHEAD IN RANGE OF BALLISTIC MISSILES

One phrase was, you said that the Russians are several hundred miles ahead of us in the range of missiles. Is that correct?

General GAVIN. Senator, I don't believe I said several hundred miles ahead of us. I did say that they have fired missiles or what appeared to be missiles, for several hundred miles.

Senator SALTONSTALL. What do you mean by "several hundred miles"—less than a thousand?

General GAVIN. Yes; less than a thousand.

Senator SALTONSTALL. And how much less than a thousand?

General GAVIN. I would say on the order of—and I would have to count upon the Chairman for the security aspects of it——

Senator SYMINGTON. All of this testimony is censored before it is released.

General GAVIN. Yes, sir. (D)

Senator SALTONSTALL. The chairman, in the question that was read back by the reporter, used the words "away ahead of us," and you answered that question affirmatively. Is that a question that applied to this, as you understand it?

General GAVIN. Yes, sir.

Senator SYMINGTON. If the Senator will yield, I emphasized that it was only on range.

Senator SALTONSTALL. Yes, I know. "Away ahead of us"—could you define that a little bit more?

General GAVIN. Well; yes, sir. I was aware that the chairman was very carefully using range, and only range.

From the viewpoint of where I sit, we are developing a family of missiles in several—many categories, to serve our combat units—surface-to-air type and surface-to-surface type.

Now, these include different propulsion systems, different guidance systems, and on a very high order of reliability. Considering the entire spectrum, we feel we are making good progress, considered in terms of range alone.

I would be the first to admit, to the best of my knowledge, they have shot further than we have.

IMPORTANCE OF MISSILE ACCURACY AND RELIABILITY

Senator SALTONSTALL. As the head of the Army in this, and a distinguished gentleman in your own right, would you say there is a great deal of need for reliability and accuracy, as well as distance?

General GAVIN. Absolutely.

This is a very instant point, that it is not too difficult to throw something out at great range, but another matter entirely to put it where you want it. This is very difficult.

Senator SALTONSTALL. General, you were an athlete?

General GAVIN. Yes, sort of.

Senator SALTONSTALL. And you know that one of the great things when it comes to football is not just to kick it way down the field, but to kick it to either side——

General GAVIN. Yes, sir.

Senator SALTONSTALL (continuing). And it is the same thing with these?

General GAVIN. Yes, sir.

Senator SALTONSTALL. Accuracy and reliability are very important factors?

General GAVIN. Very important, indeed.

Senator SALTONSTALL. And in reliability and accuracy we are making very substantial progress?

General GAVIN. I feel we are, sir.

SOVIETS VERSUS UNITED STATES IN MISSILE ACCURACY AND RELIABILITY

Senator SALTONSTALL. And whether we are ahead or behind the Russians, have you any idea of that?

General GAVIN. I really don't know. I don't know the answer to that.

Senator SALTONSTALL. Thank you.

Mr. Chairman, I think that is all.

Senator SYMINGTON. Senator Duff?

Senator DUFF. I may have a question later, Mr. Chairman.

Senator SYMINGTON. Mr. Counsel?

Mr. HAMILTON. May I ask one question, due to the importance that General Gavin attributes to the antimissile missile:

ANTIMISSILE PROBLEM

I wonder if you would care to state for the record the kind of problems that are being encountered from the standpoint of developing a missile of that kind, whether they are technical problems or lack of resources, or of money, or facilities or what?

General GAVIN. Yes, sir.

First, I noted yesterday that the chairman expressed a desire to hear a more detailed briefing on the antimissile missile problem, and I would strongly recommend that, because one of our most pressing national-defense problems is the matter of detection, I would say perhaps that is our first concern, the detection of a very small object at great heights and great distances, and, then, the detection with such accuracy as to predict the trajectory it is following, that is the first problem and it is a very serious one.

Mr. HAMILTON. Are you conducting research work in that field?

General GAVIN. Yes, sir; we are, in several areas, several concerns.

RADAR IMPROVEMENT NEEDED

Mr. HAMILTON. What is the present height of our operational radar, approximately?

General GAVIN. Acquisition height. The exact figure is classified, but it needs to be increased substantially. (D)

Mr. HAMILTON. Any other problems?

General GAVIN. No, sir; none, except—again I believe they would be covered in a briefing that you would find most interesting.

Mr. HAMILTON. All right; we will defer it until then.

Senator SYMINGTON. General, I would like to make a couple of comments and then ask a couple of questions with respect to the missile range questions Senator Saltonstall just asked you. (D)

Let the official record show that the classified résumés I just gave were the facts that have been given to the committee.

CREDIT SOVIETS WITH AT LEAST COMPARABLE PROGRESS

Now, I ask you this: Based on your experience in Korea and your study of military history, do you believe that we should assume that, just because we don't know what the Communists have in the way of development of the other component parts of missile development, we should assume that we are ahead; or do you believe we should give them the same ability for missile development that we give ourselves?

General GAVIN. From the viewpoint of research and development and my past associations with problems of this sort, which include 2 years in Weapons Systems Evaluation Group, the only real statement we can make is that they are making progress up to you or better.

DANGER OF UNDERESTIMATING AN ENEMY

Senator SYMINGTON. I remember many years ago when Admiral Davidson came back from the Pacific. He told me that not only did the United States not know the Japs had thousands of Zero fighters, we did not know they had one. They had even taken great care to fight their war in China with a lot of old crates. Then later we were shocked at the capacity of the Communist MIG–15 fighters in Korea. And I understand they were quite able in the development and production of tanks in World War II; is that correct?

General GAVIN. They turned out very fine tanks and, as a matter of fact, they surprised the Germans technically by putting into the field

their T–34 which, technically, was a jump ahead of the Germans, they surprised them with the quality of the armor and quantity, both.

Senator SYMINGTON. Do you agree that if they suddenly appeared with ICBM and IRBM in production quantities they might blackmail the world?

General GAVIN. Well, sir, you are dealing with factors somewhere beyond my area of competence, but putting it as a matter of judgment, they would put us in difficulties, I might say.

Senator SYMINGTON. And therefore if we take the position they may be ahead of us in range—which we think we know—but we are confident they are not ahead of us in the other aspects because we don't know just what they do have, we might be running a little risk from the standpoint of our security; might we not?

General GAVIN. I would say so.

QUESTION OF MONEY VERSUS ADEQUATE DEFENSE AND EQUIPMENT

Senator SYMINGTON. Even though it might cost some money—we have a pleasant way of life around here, and are still the richest country in the world after taxes—don't you think it might be well to spend whatever necessary in order to try to overcome any possible lead the Russians may have in the other components, recognizing the lead they have in range?

General GAVIN. Well, I would like to stay ahead of them in the technical field. How much of the national wealth we expend in this effort is somewhat beyond my activity, sir; there are other considerations that our Government must weigh heavily, I am sure. I would like that our American young men going into combat, however, would be getting new and better equipment well ahead of an opponent's, the Red Army or the satellites.

Senator SYMINGTON. We have had testimony before this committee that because of lack of funds we have had considerably more accidents in the air; and therefore more loss of life.

I ask you a frank statement, based on your battle experience which we all know has been extensive:

If we don't have the right equipment and get into a peripheral war, ground troops, air support and so forth, will it not inevitably result in more casualties?

General GAVIN. Yes, sir; I think that certainly would be the case.

From the viewpoint of the Army we are very concerned with the dynamic evolution that now is taking place in weaponry, in the whole field of atomics down into small, tactically useful weapons which seem to offer an aggressor an opportunity to achieve a real jump over anyone who sets out to be a second-class army by sticking more to gunpowder and not paying more attention to the future; likewise missiles, which give range; likewise, tactical mobility. The failure to go after these things aggressively now, in view of the future, could be exceedingly costly in combat—in fact, it could be decisively to our disadvantage.

TIME FACTOR IN MODERNIZATION OF SERVICES

Senator SYMINGTON. I gather from what you are saying that the tremendous advances due to nuclear weapons mean we have to re-

vitalize and reorganize our Army, just as much as our Navy and Air Force; is that correct?

General GAVIN. Absolutely, and the time factor is such now that we no longer have even 100 years to understand technology, which we did with the introduction of gunpowder, the needlegun, and the like.

Now you have to understand it before the battle. Otherwise, you will be a fourth-class army, and you will find that out in about 12 hours.

PROGRESS VERSUS TRADITION

Senator SYMINGTON. I think it was Field Marshal Montgomery who said last October that if the free world does not start building on the basis of progress and stop building on the basis of tradition, it will go broke. Would you agree with that statement?

General GAVIN. I would agree with the statement; yes, sir.

Senator SYMINGTON. Do you think we are spending—I am not talking about appropriations or authorizations, they make great headlines, but don't mean anything in the last analysis—do you think we are spending enough money today on the United States Army to make it a modern army in case we have to go to war?

NOT MODERNIZING ARMY AS RAPIDLY AS NEEDED

General GAVIN. Well, I believe that those who are charged with providing the Army with the equipment needed, and they must do that with consideration for the other needs of our Government and the economy, are doing as well as they can.

I personally would like to see more done for the Army.

Senator SYMINGTON. Based on your knowledge of the past and your knowledge of the Russian potential and the fact you are the head man in the Army on research and development, do you believe we are developing as rapidly as we should that modern army needed in case we are attacked by the Communists?

General GAVIN. No, sir; I don't. I don't feel we are.

Senator SYMINGTON. Counsel, any questions?

Mr. HAMILTON. No.

Senator SYMINGTON. Senator Saltonstall?

Senator SALTONSTALL. I just want to say, Mr. Chairman, having heard General Gavin, I think that he has been an excellent witness and a very honest one and one who expresses himself very well, as I know every Irishman can [laughter].

Senator SYMINGTON. Now off the record.

(Discussion off the record.)

Senator SYMINGTON. Senator Duff?

Senator DUFF. No. I am trying to find something here. I will have questions if I find it. I have not been able to put my finger on it—on something I understood he said yesterday.

Senator SALTONSTALL. Mr. Chairman, is that all this morning?

Senator SYMINGTON. Yes.

Senator SALTONSTALL. I would like to propose a very brief executive committee meeting on procedure when we are through with the Army.

APPRECIATION

Senator SYMINGTON. I would be happy to accede to the wishes of my distinguished colleague from Massachusetts.

General Gavin, these briefings you have given us, in the opinion of the Chair, have been magnificently handled.

General GAVIN. Thank you.

Senator SYMINGTON. We have never seen better briefings, in my opinion, since I have been on the full committee.

Please go over the testimony. If there are any inaccuracies, please get in touch with us. Our staff will go through the figures and get in touch with Colonel Small in case we want clarification for the record.

Will you hold yourself in readiness to discuss the question of airlift?

General GAVIN. Yes, sir.

Senator SYMINGTON. Inasmuch as there has been a request by Senator Saltonstall and Senator Duff to get into Naval Air; I think we also ought to have the story from the Army.

General GAVIN. Yes, sir.

Senator SYMINGTON. If there is no further business, we will have the Navy this afternoon at 2 o'clock, if that meets with the approval of Admiral Clark and his people.

Admiral, will you and your group be here at 2 o'clock?

Admiral CLARK. Yes, sir.

Senator SYMINGTON. We will recess into executive hearing.

(Whereupon, at 11:50 a. m., the committee went into executive session, to reconvene in further top-secret session at 2 p. m. of the same day.)

AFTERNOON SESSION, FRIDAY, JUNE 1, 1956

Present: Senators Symington (presiding) and Duff.

Also present: Fowler Hamilton, General Counsel; Ramsay D. Potts, Jr., Associate General Counsel; Fred B. Rhodes, legal consultant to Senator Saltonstall; Edward C. Welsh, assistant to Senator Symington; and Wallace L. Engle, staff member; Brig. Gen. Thomas C. Musgrave, Jr., USAF; Lt. Col. Donald S. Bussey, Plans Directorate, ODCSOPS, DA; Brig. Gen. Ronald D. Salmon, USMC, Assistant Director, Division of Marine Aviation, Office of Chief of Naval Operations; Comdr. S. H. MacGregor, Jr., Comdr. J. F. Schremp, JAG; Captain Robertson, Captain Massey, Captain Outlaw, Comdr. J. S. Elkins, Comdr. M. E. Haller, Rear Adm. J. S. Russell, Comdr. W. W. Suydam, Comdr. M. F. Weisner, Comdr. R. E. Warner, Comdr. R. D. Macklin; Capt. S. R. Brown, Rear Admiral Griffin, Vice Admiral Combs, Capt. J. S. McCain, Capt. D. L. Martineau, Rear Adm. W. V. Davis; Capt. S. S. Searcy, Capt. F. A. McKee and S3c J. G. Mucheck; Jack Stempler, Assistant General Counsel, Department of Defense; Clarke A. Morgan, OSD Security Office; Bernard S. Bogdanowicz, OSD Security Office; Lt. Gen. James M. Gavin, Chief of Research and Development, Department of the Army; Maj. Gen. Russell L. Vittrup, Assistant Deputy Chief of Staff for Military Operations, Department of the Army; Brig. Gen. John P. Daley, Director of Special Weapons, Office, Chief of Research and Development, DA; Dr. Wernher von Braun, Director, Development Operations Division, Army Ballistic Missile Agency, Huntsville, Ala.; Richard R. Hough, director of military electronics development,

Bell Telephone Laboratories, Whippany, N. J.; Col. Louis B. Grossmith, Jr., Special Staff Group, Headquarters, USAF; William C. Tinus, vice president, Bell Telephone Laboratory, Whippany, N. J.; Col. Arthur C. Small, Office, Chief of Research and Development, Department of Army; Lt. Col. John R. M. Covert, Office, Chief of Research and Development, DA; Lt. Col. Vallard C. Smith, Office, Chief of Research and Development, Department of the Army; Lt. Col. Woodrow B. Sigley, Office, Chief of Research and Development, DA; and Lt. Col. Elmer P. Curtis, Office, Chief of Research and Development, Department of the Army.

Senator SYMINGTON. We will call the subcommittee to order.

General Gavin, you have been sworn.

Do you have anybody else to testify who has not testified previously?

General GAVIN. Yes, Mr. Chairman, I have three witnesses today I would like to have now sworn, Dr. Tinus, Mr. Hough, and Dr. von Braun.

Will you come up please?

These are the additional witnesses.

Senator SYMINGTON. Gentlemen, please raise your right hands. Do you solemnly swear that the information you give this subcommittee on the Air Force of the Senate Armed Services Committee will be the truth, the whole truth, and nothing but the truth, so help you God?

Dr. TINUS. I do.

Mr. HOUGH. I do.

Dr. VON BRAUN. I do.

Senator SYMINGTON. Will you proceed?

General GAVIN. Mr. Chairman, I have this afternoon two short briefings at the request of the committee, the first on the antimissile missile by Mr. Tinus and Mr. Hough, of Bell Laboratories. It is a short briefing and I will be prepared after the questioning following their briefing to present a briefing by Dr. von Braun on the IRBM program.

Mr. Hough is ready to proceed now, sir.

Go right ahead, sir.

TESTIMONY OF RICHARD R. HOUGH, DIRECTOR OF MILITARY ELECTRONICS DEVELOPMENT, BELL TELEPHONE LABORATORIES

Mr. HOUGH. I understand you had a previous briefing on the Army's surface-to-air missile program and that you are particularly interested in hearing somewhat more about the problem of active defense.

Senator SYMINGTON. Mr. Hough, will you identify yourself?

Mr. HOUGH. My full name is Richard R. Hough, director of military electronics development at the Bell Telephone Laboratories.

Senator SYMINGTON. Thank you.

DEFENSE AGAINST THE BALLISTIC MISSILE

Mr. HOUGH. So that my remarks today will be directed toward this specific problem of the active defense against the ballistic missile.

I will try to be brief and leave ample time for any questions. I would be glad to try to answer any which are within my field of competency.

My remarks are part of information that has been growing out of a study which is currently underway and continuing. As you can well realize with the technology and art advancing as it is today, this program must be a continuous program in order that not only may it keep up with the state of the art but it may do its part in advancing the art in this guided missile field. (D)

CONTINUAL PROGRAM REVISION UNDESIRABLE

While the research and development program is a continuous one, it is important that this not be a reason for the continual revision of development and production programs aimed at operational use, but rather at selected intervals as dictated by a number of factors.

Parts of the program must be crystallized for actual development aimed toward operational use, and the selection of these steps is a matter of very careful balance among such factors as the threat, the state of the art, economics, time intervals.

Once these objectives are decided upon, then it is very important that the development stick to these and avoid continual reorientation if they are to result in a system in the time in which it is needed.

A FORMIDABLE TARGET

As you are well aware, the target we are talking about today, the ICBM, is a very formidable target, and I would like to review just briefly the reasons why it is so formidable.

First of all and foremost is the very high speed, in the neighborhood of 4 miles a second.

This is almost 30 times the speed of manned bombers that are flying today.

And this makes the problem of obtaining information on this target very difficult.

A high speed of a target translates directly into required radar range. If you think, for example, if you want 10 minutes warning on a target such as those that are flying today in the manned bomber class or those that will be flying shortly, this is about 120 miles radar range.

But if you want 10 minutes warning on this ICBM target, then you must have 2,400 miles range, and this is a tremendous increase in the required radar range.

The second characteristic of the target is its small size. It is a very poor radar target. This increases the difficulty of the requirement on the radars.

Next it is a very tough target. Either you must cause the enemy warhead to explode well above the altitude where it will do any damage to ground installations, or you must destroy the warhead so that it cannot explode with a nuclear explosion. And to do this is difficult. (D)

HIGH LEVEL OF DEFENSE NECESSARY

Another factor that makes the problem difficult is the necessity for a very high level of defense. The sort of attrition that was talked

of and felt to be a reasonably good defense in World War II is not anything that you can tolerate when you are worrying about enemy missiles with warheads in the megaton range such as an ICBM.

So this high level of defense is very necessary. The ICBM or IRBM ballistic missile has one favorable characteristic; that is that most of its trajectory is perfectly predictable, since it travels the laws of interplanetary space, and all but the latter part of the flight where it reenters the atmosphere is completely predictable. (D)

STATE OF THE ART

Senator SYMINGTON. So what we are discussing now, as I understand it, is a mathematical situation, one that we will try to develop into reality, but so far theoretical.

Mr. HOUGH. It is nothing that is in existence at the present, but I think the tools within the state of the art are present to enable the development of such a radar. (D)

All of this does not require new invention to a large extent.

It just means extension of a lot of the things that have come along in the last 10 years, but I would not minimize the problem.

Senator SYMINGTON. I don't want to be contentious; but would it not be like saying you have an automobile that goes 200 miles an hour, and will try for one that goes 400 miles an hour? It does not require new invention maybe, but it will require a great deal of additional work.

Mr. HOUGH. It certainly does.

Senator SYMINGTON. Have you seen anything yet that makes you confident it can be done?

CONFIDENCE RE A DIFFICULT JOB

Mr. HOUGH. Yes, I think it can be done, but as you say, it is not something you do overnight or do very easily. It is a difficult job that requires a lot of engineering and a lot of hard work.

Senator SYMINGTON. Thinking it can be done and being confident it can be done are two different matters.

If you had three or four hundred ICBM's shot off, and to make three or four hundred of them would be relatively cheap, you are going to have a right big problem of interception, aren't you?

Mr. HOUGH. No question about it.

Senator SYMINGTON. We put a thousand B–17's over Berlin in 1 night and 800 plus B–29's over Japan in 1 night. Five years before nothing like that would have been considered remotely possible.

In this case, as I see it, you have not only the problem of knocking that quantity down, but also the problem of building whatever is necessary on the ground to knock them down, right?

Mr. HOUGH. That is right. (D)

Any defense system must have a very high traffic handling capability. This is just absolutely essential, no question about it.

Senator SYMINGTON. Excuse me for interrupting you.

Mr. HOUGH. That is perfectly all right.

Interrupt me at any time.

Senator SYMINGTON. If we can discuss it a bit as you go on, it makes it clearer for us, because it is so far out of our field.

Mr. HOUGH. I will be glad to try to answer any questions you have.

EARLY WARNING SYSTEM ESSENTIAL

We spoke of the early warning which to a large extent has been outside the scope of the study, it being something that the Air Force has under way and that we are counting on being available. (D)

Now I think it is readily apparent that any such defense cannot be taken lightly. It requires a tremendous coordination.

The times are very short. Fast action must be taken. Everything must be automatic. Humans can only have veto power. They cannot make decisions. (D)

Senator SYMINGTON. You would have to have 24-hour-a-day continuous radar examination, wouldn't you?

Mr. HOUGH. That is right.

Senator SYMINGTON. Overall potential areas of the world where a missile might come from.

In the old days, 20 some years ago, I remember working on the first radar scopes. You would have some object, something stuck up a little higher than normal; and you would try to find out what it was in that locality.

In this case, you would have to be sure any bump, or speck, was an ICBM.

Mr. HOUGH. You are exactly right. There are a number of problems I have not touched on. You would have to have automatic means of separating out meteorites for example. These can present a problem.

I think the very things you point to are reasons why the early warning is of vital importance. You want to get as much time as possible, and it is also important because the actual engaging batteries here would find it very difficult to keep on 24-hour alert 7 days a week, and just this 10 minutes can make a large difference. (D)

COMPLEX SYSTEM

This is a very formidable network, tactical control and communications, and the entire success of the system depends among other things on how well this system is executed, put together, and operated. (D)

I mentioned the study that is underway, and it is obvious that any defense problem as complex as this must be preceded by a very thorough study, but as the study has progressed, it has become apparent that work needed to be done in certain areas. (D)

LIMITING FACTOR

Mr. HAMILTON. Viewing the system that you have described, as a whole, including those parts of it that I understand are the responsibility of the Air Force, what would you say are the principal limiting factors?

Mr. HOUGH. The limiting factor in this whole problem is the one of information, and my opinion is that the most difficult problems are the problems of radar information soon enough, accurate enough, and

the problem of tying all these sources of information together in the integrated system that can function automatically. (D)

COST BILLIONS OF DOLLARS

Mr. HAMILTON. Do you have any idea what it would cost to provide a system of this kind, assuming it could be developed and would be adequate in scope?

Mr. HOUGH. Maybe that is something that you people could answer, General Gavin.

General DALEY. We have no estimate at this time on what this would cost. I can assure you it would cost a lot.

General GAVIN. The overall system's cost such as the system outlined here? We can make an estimate for you and put it in the record later.

Senator SYMINGTON. It would be a great many billion dollars to cover the United States with any real degree of protection, wouldn't it?

General DALEY. Yes, sir; you are talking in billions of dollars now.

Mr. HOUGH. I might amplify this a little bit.

When we finish this study I think we will all have a better feel for what it might cost. (D)

Senator SYMINGTON. Senator Duff?

Senator DUFF. I just jotted this down for information.

With the information you have acquired and the tools you have developed, do you believe you are on the track that will lead to the solution to the problem of interception of these missiles?

Mr. HOUGH. Yes; we think this study that is underway has a very solid technical base. (D)

Senator DUFF. That is all I have.

Senator SYMINGTON. You are going to furnish for the record the estimated amount of money that would be involved, based upon what is currently known about launchings?

WHEN AVAILABLE?

Would you tell us by what year you feel you could have a thing of this character?

Mr. HOUGH. Well, from the development standpoint, of course, this depends on how much urgency the problem is given and how much pressure is put on it. I will discuss the estimates in classified form. (D)

APPRECIATION

Senator SYMINGTON. It certainly is interesting and we are very grateful to you for your presentation.

Mr. HOUGH. You are welcome, I am sure.

General GAVIN. Mr. Chairman, Dr. von Braun is here to make a presentation on the IRBM.

Dr. Hough and Dr. Tinus will remain in case any questions are brought up in the relation to this.

Senator SYMINGTON. Doctor, we welcome you.

Dr. VON BRAUN. Thank you, sir.

General GAVIN. Dr. von Braun is making a short presentation, about 15 minutes, as a springboard, let us say, for questions in the field that may follow.

Senator SYMINGTON. Will you proceed, Doctor?

First will you identify yourself?

TESTIMONY OF DR. WERNHER VON BRAUN, DIRECTOR, DEVELOPMENT OPERATIONS DIVISION, ARMY BALLISTIC MISSILE AGENCY, HUNTSVILLE, ALA.

Dr. VON BRAUN. I am Dr. Wernher von Braun and my job title is director of Development Operations Division of the Army Ballistic Missile Agency in Huntsville, Ala.

Senator SYMINGTON. May I ask you a couple of questions?

EXPERIENCE IN GERMANY AND UNITED STATES

You were at Peenemunde, were you not?

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. When did you start working on missiles at Peenemunde?

Dr. VON BRAUN. From 1937 on, but this work was preceded by other work on a much smaller basis.

Senator SYMINGTON. And where was that done?

Dr. VON BRAUN. That was on the German Army proving ground 50 miles south of Berlin.

Senator SYMINGTON. Did you work in that also?

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. And so for how many years have you been working in the missile field?

Dr. VON BRAUN. Since 1930, sir.

Senator SYMINGTON. Since 1930?

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. Twenty-six years?

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. Do you know anybody who has been working in the field any longer?

Dr. VON BRAUN. Sir, in 1930 you could not call these things missiles yet.

Senator SYMINGTON. They were called rockets then, I suppose?

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. But for people that are still walking around, you have been in it just about as long as anybody, is that a fair statement?

Dr. VON BRAUN. Yes.

THE JUPITER MISSILE

This is a picture of the Jupiter missile. The Jupiter is an intermediate range ballistic missile with a maximum range of 1,500 nautical miles. (D)

The Jupiter missile has capabilities for ship launching as well as for land-based launchings. (D)

Senator SYMINGTON. When you say take off from ships, is that theory?

Dr. VON BRAUN. No, sir, we are practically working all aspects of ship-board firing requirements also, and these requirements are designed right from the beginning into the missile.

Senator SYMINGTON. And you and the Navy are working together on that?

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. And they feel that it can be launched from ships?

Dr. VON BRAUN. Yes, sir, The Navy is putting in definite effort on their own to convert ships to the firing of these. (D)

Senator SYMINGTON. How do you expect this to compare with the Nazi V–2?

Dr. VON BRAUN. Much greater range and accuracy. (D)

The Chrysler Corp. in Detroit has been phased in as a prime contractor for the Jupiter program, and has already a liaison staff in Huntsville to train the engineers, and for the exchange of technical information.

FINANCING PROGRAM

The money situation is as follows:

For fiscal year 1956, we had a total of $33.7 million for the Jupiter program. (D)

Senator SYMINGTON. What do those figures represent?

Dr. VON BRAUN. These are total figures, including supporting research, R. and D. money, and P. and P.

Senator SYMINGTON. What is P. and P.?

Dr. VON BRAUN. Procurement and production.

Senator SYMINGTON. Procurement and production?

Dr. VON BRAUN. Yes.

Senator SYMINGTON. How much of that money have you had approved?

General GAVIN. How much of it has been approved?

Senator SYMINGTON. Yes.

General GAVIN. I am not sure that I got the category——

Senator SYMINGTON. What is the program on money at this time with regard to this missile?

Colonel SMALL. The 1956 fiscal year program, of course, has been approved.

Senator SYMINGTON. How much is that?

Colonel SMALL. Ten million for research and development funds——

Senator SYMINGTON. How much? I am sorry, our acoustics here are not as good as they might be.

Colonel SMALL. Ten million for research and development funds.

Senator SYMINGTON. Yes.

Colonel SMALL. Thirty-three million for procurement and production funds.

Senator SYMINGTON. That is this year?

Colonel SMALL. Yes, sir. (D)

Dr. VON BRAUN. This ends my presentation, sir.

Senator SYMINGTON. Thank you.

Mr. Counsel?

Mr. POTTS. Dr. von Braun, the money figures that you gave, as I understand it, were the funds from all budget sources that contribute to this program.

Dr. VON BRAUN. Yes, sir.

Mr. POTTS. Does the Navy contribute any money from its own budget?

Dr. VON BRAUN. The Navy has separate funds which I have not listed.

General GAVIN. Yes; the Navy does have funds for this, which are funded separately.

Mr. POTTS. I see.

General GAVIN. And then the program is coordinated in a committee under Secretary Thomas, of the Navy, and Secretary Brucker.

Mr. POTTS. I understand.

General GAVIN. Both programs are kept in close coordination, and the funding is approved by this combined committee of Secretaries.

Mr. POTTS. Yes. But some of the Navy funds actually are used on this phase of the development program, that is, the development of the missile itself?

General GAVIN. On the Navy, the shipboard adaptation, problems.

Mr. POTTS. But not in the development program you have just been discussing?

General GAVIN. No; not directed to this. And I would suggest that when the Navy makes its presentations they be questioned about their program. They can answer that in detail.

Mr. POTTS. Thank you.

JUPITER VERSUS AIR FORCE IRBM

Doctor, could you tell us what the difference is in the theory of Jupiter and the theory of the Air Force IRBM that they are working on?

Dr. VON BRAUN. Well, sir, in the first place, the Jupiter missile is designed for ship- and land-based capability, whereas the IRBM–1 is for land-based capability only.

Senator SYMINGTON. What is the difference? What is the result of that distinction?

Dr. VON BRAUN. Well, I would say shipboard launching capability must be designed into a missile right from the beginning and cannot be engineered into it at some later time, whereas once you have the ship-based capability you automatically have the land-based capability. (D)

Senator SYMINGTON. Senator Duff?

Senator DUFF. I only want to say it has been a fabulously interesting presentation.

Dr. VON BRAUN. Thank you, sir.

HISTORY OF NAZI V–2 MISSILE

Senator SYMINGTON. Doctor, I want to ask you about a bit of history. This missile picture has come on us all very fast.

When did they build the first V–2 missile?

Dr. VON BRAUN. That was in the spring, 1942.

Senator SYMINGTON. And you fired it in the spring of 1942?

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. When did they launch the first V–2 against England?

Dr. VON BRAUN. September 1944.

Senator SYMINGTON. And how many did you launch against England, all told?

Dr. VON BRAUN. I don't have the exact figure here, sir.

Senator SYMINGTON. Give a rough figure, and then correct it for the record.

Dr. VON BRAUN. I think a total of 3,600 V–2's were fixed operationally, out of which approximately 1,500 were against targets in England.

Senator SYMINGTON. You used some against targets on the Continent, did you not, like Antwerp.

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. How many of those were good, that is, did not abort, that you know of? To put it another way, how many did abort, of those 3,600?

Dr. VON BRAUN. Of course, we had no feedback on which ones really hit, so we can talk about the first phase of the flight only.

Senator SYMINGTON. How many failed in launching?

Dr. VON BRAUN. I would say about 30 percent failed visibly, either as a result of a thrust failure or guidance failure, so that the people in the launching site knew this was a fizzle.

But this does not necessarily mean that the remainder of 70 percent really reached the target.

Senator SYMINGTON. What was your chief trouble?

Dr. VON BRAUN. It was split even between engine and guidance system.

Senator SYMINGTON. Between the engine and guidance?

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. How many people did you have working at Peenemunde on this?

Dr. VON BRAUN. At the peak, between the peak effort during the war, including soldiers that were in training, and so forth, approximately 6,000 men.

Senator SYMINGTON. Six thousand?

Dr. VON BRAUN. Yes. But the hard core was about 3,600.

Senator SYMINGTON. What was your title at the end of the war?

Dr. VON BRAUN. I was technical director of the Army experimental station, Peenemunde, from the beginning to the end of the war.

Senator SYMINGTON. Who did you report to?

Dr. VON BRAUN. My boss was General Dornberger, who was in charge of the V–2 program, in overall charge.

Senator SYMINGTON. Where were his headquarters?

Dr. VON BRAUN. For a while in Berlin, and for a while at Peenemunde proper, and also at a small city, Schwedt, on the Oder River.

Senator SYMINGTON. Did you have difficulty in getting priorities to make these, or did the Fuehrer, or whoever was running it, give you a maximum priority on these missiles? Did you have an overriding priority?

Dr. VON BRAUN. Sir, there was much hot and cold blowing in this matter until we had demonstrated the success of the principle. We had great difficulties, and Hitler himself was greatly opposed to the idea. It actually was the army command that ran the thing through, even against his will.

And then later on, after we had demonstrated it worked, we were swamped with so much priority that it hurt more than it helped.

Senator SYMINGTON. When did that change come?

Dr. VON BRAUN. It was in October 1942, after the first successful firing of a V–2. I said in the spring we tried for the first time, in October we succeeded in flying the first one.

Senator SYMINGTON. From where were you firing? From where to where?

Dr. VON BRAUN. From Peenemunde over to the Baltic Sea.

Senator SYMINGTON. How did you know it was successful?

Dr. VON BRAUN. We had a green dye marker in the missile, and discovered the dye marker in the water.

Senator SYMINGTON. In the water?

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. And how many were you making of these—you were making them in one particular plant; where was that plant?

Dr. VON BRAUN. Experimental missiles were always built in Peenemunde.

Senator SYMINGTON. I mean your production plant.

Dr. VON BRAUN. Later on, we went into production near Nordhausen in a subterranean plant.

Senator SYMINGTON. How many did you make a month in that plant?

Dr. VON BRAUN. They made approximately 300 per month at the peak.

Senator SYMINGTON. How many people did they have working there?

Dr. VON BRAUN. This Nordhausen plant was only the assembly plant, and they manufactured a few bottleneck items there. Most of the components were built all over Germany, in industry. I think in Nordhausen they had about 8,000 people.

Senator SYMINGTON. Twenty thousand?

Dr. VON BRAUN. Eight thousand.

Senator SYMINGTON. Eight thousand. How many would you say, as a rough guess, were in the whole setup?

Dr. VON BRAUN. In the entire program, including components manufacturers, at the peak, maybe 40,000 people. That includes everybody.

ATTITUDE OF OTHER GERMAN SERVICES

Senator SYMINGTON. Did you have any resistance to your development of the missiles from the other services? Was the air force cold on the idea, or the army or navy, or all three of them, or none of them?

Dr. VON BRAUN. I would say before we had demonstrated our cause, they laughed at us; and later on, after we had demonstrated, they all wanted to get on the bandwagon and share the glory.

Senator SYMINGTON. All jumped on?

Dr. VON BRAUN. Yes, sir.

WHERE GERMAN SCIENTISTS WENT

Senator SYMINGTON. You had some people down with you at Huntsville who worked with you at Peenemunde?

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. How many?

Dr. VON BRAUN. One hundred twenty, approximately.

Senator SYMINGTON. One hundred twenty, all told?

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. And they were all part of what you called that hard core; is that right?

Dr. VON BRAUN. That is right; yes, sir.

Senator SYMINGTON. How many of the people who worked at Peenemunde did the Communists get?

Dr. VON BRAUN. I don't know the total number, but I know of approximately 10 or 15 topflight scientists and topflight engineers who went over. The bulk of the people they got apparently were production people.

Senator SYMINGTON. From this plant at Nordhausen?

Dr. VON BRAUN. And other components plants inside of Germany that were in the V–2 production. Apparently they were mainly interested in cranking the V–2 production up after the war, so they took production people.

RANGE OF V-2 AND REDSTONE

Senator SYMINGTON. We had a briefing on the range of the V–2 as being between 150 and 200 miles; is that about right, or what are the correct figures?

Dr. VON BRAUN. Two hundred statute miles is about the maximum range.

That is statute miles.

Senator SYMINGTON. What is your range on the Redstone?

Dr. VON BRAUN. We test at about the same range. It could be set up to go farther, but we are testing primarily for accuracy. (D)

VON BRAUN'S SERVICES

Senator SYMINGTON. When did you first come to this country?

Dr. VON BRAUN. In 1945, sir; September.

Senator SYMINGTON. And have you been working for the Army ever since?

Dr. VON BRAUN. Ever since, sir.

Senator SYMINGTON. How is it they let you get by on the ICBM program? Why didn't they get you for that?

Dr. VON BRAUN. Because I work for the Army, and that is the Air Force's.

Senator SYMINGTON. Did they try to get you later?

Dr. VON BRAUN. I never have been approached, sir.

Senator SYMINGTON. What?

Dr. VON BRAUN. I have never been approached.

Senator SYMINGTON. The Air Force is not as smart as I thought they were. [Laughter.]

Just a couple of more questions. Do the Air Force people discuss the ICBM with you?

Dr. VON BRAUN. Yes, sir.

LIAISON

Senator SYMINGTON. You work with them, and they work with you?

Dr. VON BRAUN. Quite familiar. Yes, sir, we have an exchange of information with western development division of Ramo-Wooldridge, and they know what we are doing and we know what they are doing.

Senator SYMINGTON. Are these developments pretty close in their approach to the problem?

Dr. VON BRAUN. Do you mean are they close to reaching our objective?

IRBM VERSUS ICBM

Senator SYMINGTON. In other words, in general, is their design fairly comparable to yours?

Dr. VON BRAUN. Yes, sir. The ICBM is a much more difficult problem.

Senator SYMINGTON. Do they aproach it on the same basis you do, or do you have a different approach?

Dr. VON BRAUN. Well, there are some differences in, shall we say, general design philosophy, but by and large, I think this is very sound.

Senator SYMINGTON. They have a more difficult reentry problem because their Mach is so much higher?

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. Why is it, in your opinion, that they got off to such a head start as against the development of the Jupiter?

Dr. VON BRAUN. Well, sir, this I don't know. Technically, the Jupiter would have been a logical intermediate step, in my opinion. In other words, it is certainly simpler to build a 1,500-mile missile from what we know now, than an ICBM.

Senator SYMINGTON. You think it would have been better for them to try the IRBM first, and then go to the ICBM?

Dr. VON BRAUN. Technically speaking, this would have been simpler, more logical; I am convinced of that.

Senator SYMINGTON. If they had done that, they would have gotten the IRBM sooner; would they not? They certainly would have gotten it sooner than they are going to get their own IRBM, which is way behind the one you are working on.

Dr. VON BRAUN. Yes, sir.

REDSTONE PROBLEMS SOLVED

Senator SYMINGTON. Finally, you have got the Redstone missile, and you believe in it; that is right, is it not?

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. Technically, you think its problems, in effect, are solved, except for minor details; am I right?

Dr. VON BRAUN. Yes, sir. ⓓ

SOVIETS AHEAD IN MISSILE RANGE

Senator SYMINGTON. Why is it, do you think, that the Soviet has been able to fire missiles farther than we have for some time?

Dr. VON BRAUN. Sir, you asked me this question about three-quarters of a year ago, and I have given this whole subject much thought in the meantime.

I think I can furnish at least some answers, or at least some theories of what happened there.

Senator SYMINGTON. In reference to that meeting, I believe you were there, were you not, General?

General GAVIN. Yes.

Senator SYMINGTON. At that session there was also the Secretary of the Army and the Chief of Staff. I think you were there too, Mr. Welsh, weren't you?

Mr. WELSH. Yes, I was there.

Senator SYMINGTON. We had a meeting about 2 years ago or maybe it was about a year and a half ago.

General GAVIN. About a year and a half ago.

Senator SYMINGTON. On the subject of missiles.

Dr. VON BRAUN. Yes, sir.

Senator SYMINGTON. All right, you were going to answer my question.

Dr. VON BRAUN. I will give you my analysis in classified form. (D)

PROTOTYPES VERSUS PRODUCTION

Senator SYMINGTON. In this country there seems to be a habit which we have noticed consistently in the airplane field; namely, to compare our prototypes with their production units. For example, they flew 50 Farmers, at the time we had but 2 of the comparable airplanes in this country.

Now there is no reason, is there, why they have not got a better missile than the Russians' intermediate range missile you referred to earlier, if they went to work on it?

Dr. VON BRAUN. No question about it. (D)

APPRECIATION

Senator SYMINGTON. This presentation is very interesting.

General Gavin, have you any comments you would like to make?

General GAVIN. No. I know of nothing that I could add to this.

Senator SYMINGTON. Is there anything you think we should ask to develop this record? This has been a most constructive missile briefing.

Do you not agree, Senator?

Senator DUFF. Yes, I do.

Senator SYMINGTON. It gives us a better feel of it than anything on this phase of it that the committee has had to date. Do any of your staff wish to add anything to this discussion?

General GAVIN. I should say that we are convinced that the essence of achievement is teamwork in this field, and we have a fine team that we want to keep together and get on to business to give the country its

first IRBM, and we have great confidence in this team that Dr. von Braun heads.

Senator SYMINGTON. Dr. von Braun, this has been a splendid presentation. You seem very clear, very sure. I congratulate you. We wish you all success, you and your staff.

Dr. VON BRAUN. Thank you, sir.

Senator SYMINGTON. Thank you very much.

(Whereupon, at 4:05 p. m., the subcommittee recessed, to reconvene at 10 a. m., Wednesday, June 6, 1956.)